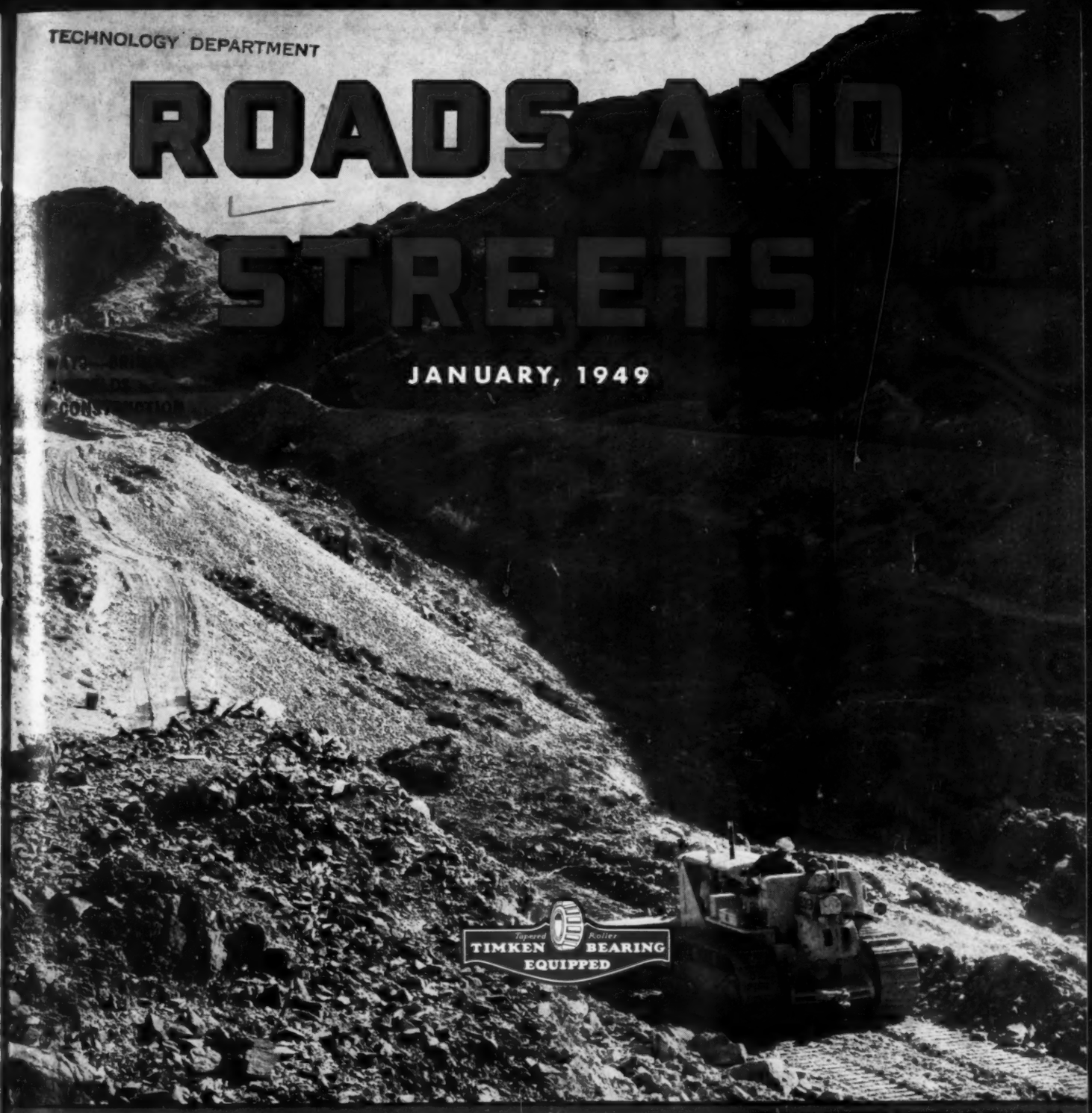
TECHNOLOGY DEPARTMENT

ROADS AND STREETS

JANUARY, 1949



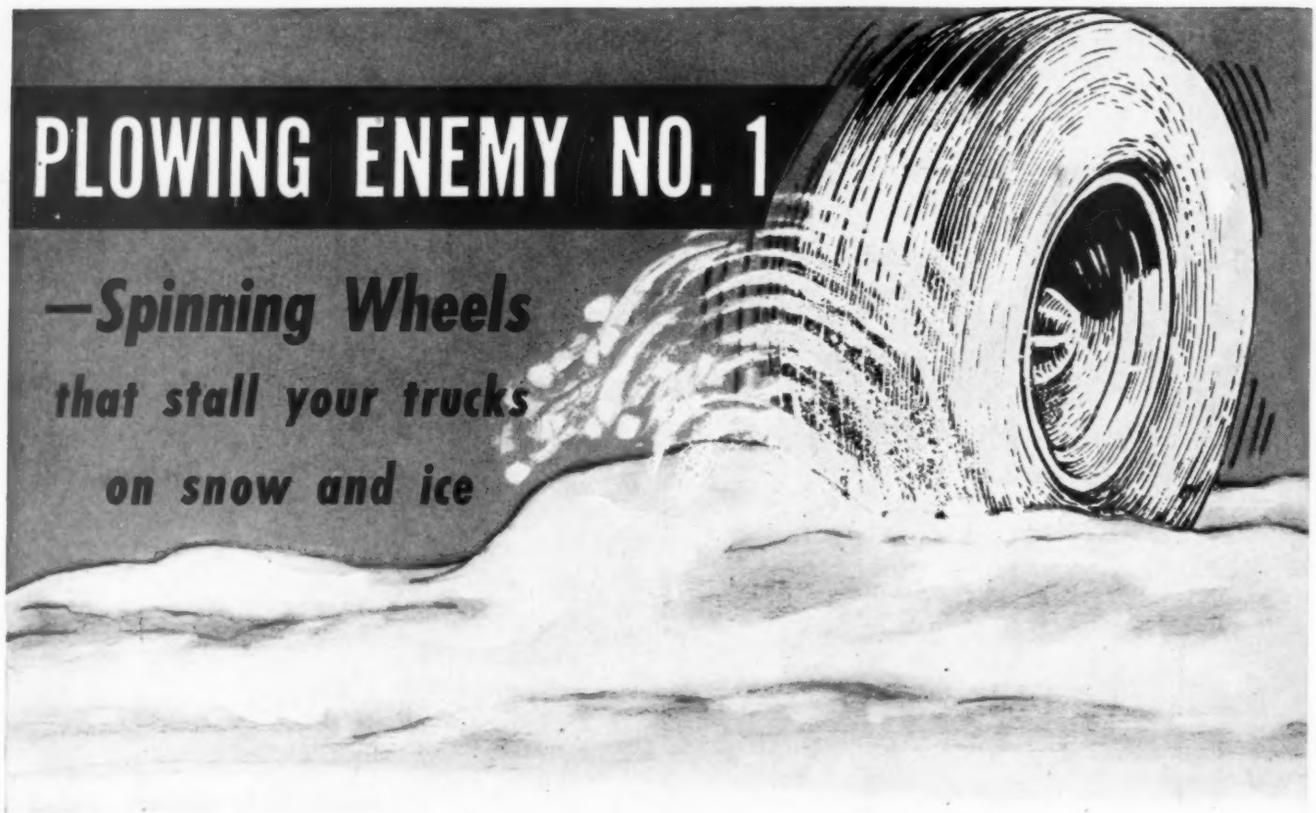
PHOTOGRAPH COURTESY CATERPILLAR TRACTOR CO.

Tough Going At Yumagila Bend

This photograph taken in January, 1947 shows part of the 7½ mile Yumagila Bend road under construction in the Rocky Mountains of Arizona. The project involved the removal of 100,000 yards of rock material.

At the bottom of the picture, dwarfed by the immensity of the surrounding terrain, can be seen a "Caterpillar" Diesel D8 Tractor equipped with "Caterpillar" Cable Control and "Caterpillar" No. 8A Bulldozer.

For many years Caterpillar Tractor Co. has equipped its machines with Timken tapered roller bearings to take advantage of their ability to overcome friction and to withstand radial, thrust and combined loads and shocks. "Caterpillar" equipment is designed to operate where the going is tough. The use of Timken tapered roller bearings in "Caterpillar" machines means longer life and freedom from frequent maintenance attention. Operators will tell you it pays to specify and install Timken tapered roller bearings. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address "TIMROSCO".



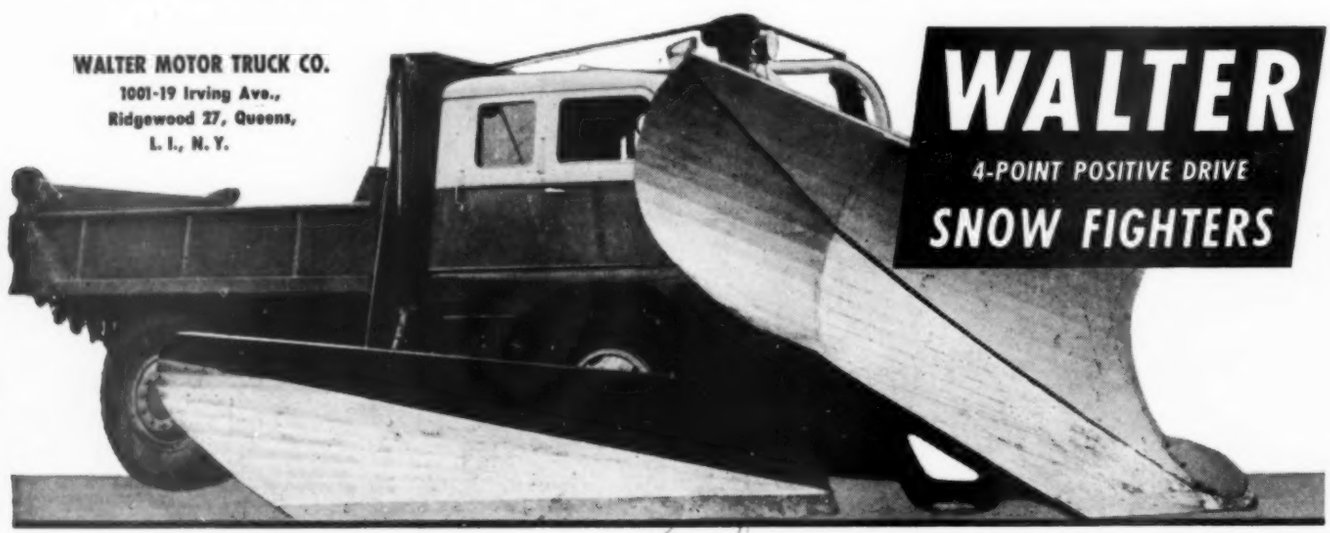
Only WALTER 4-POINT POSITIVE DRIVE prevents wheel-spinning . . . assures 100% traction

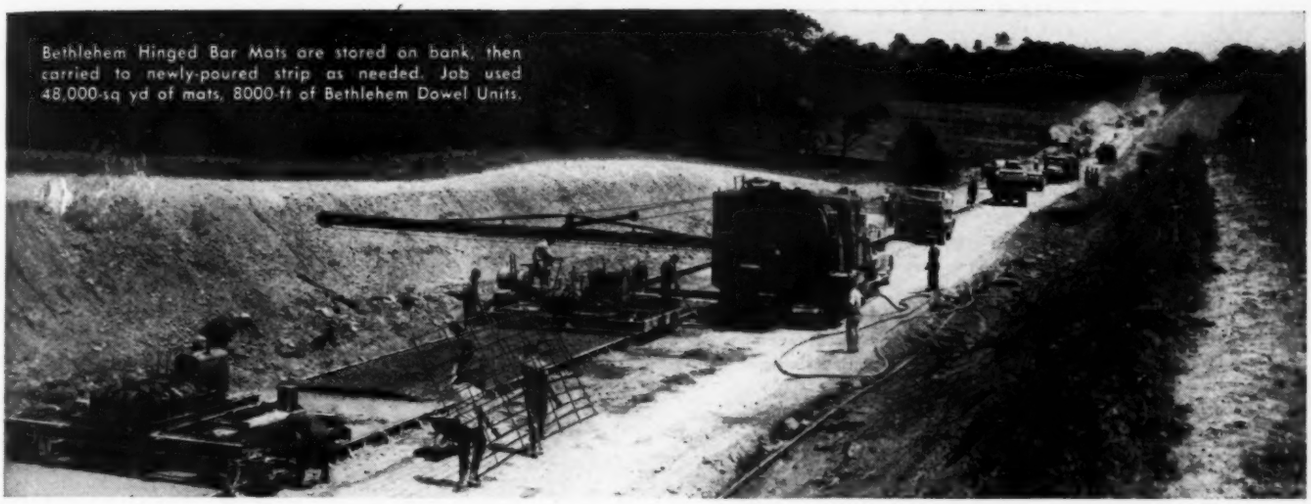
UNLESS you are using Walter Snow Fighters, your snow removal work is often seriously handicapped because your trucks are slowed or stopped by loss of traction. Especially on slippery surfaces or grades—widening high snow banks—or bucking deep drifts.

This does not happen with Walter Snow Fighters. They are the only equipment with the 100% traction of Walter 4-Point Positive Drive. Unlike conventional drives, there are never spinning wheels to stall your Walter unit. Instead, Walter patented automatic locking, torque proportioning differentials always concentrate the most power on the wheels having the most traction.

That is why Walter Snow Fighters have such fast pick-up on snow and ice—generate so much more power and push—clear a greater volume of snow, at higher speeds—and keep going when all other equipment is stalled.

• Ask your Walter dealer to explain the many exclusive engineering features of Walter Snow Fighters. Or, write us for detailed, illustrated literature.





Bethlehem Hinged Bar Mats are stored on bank, then carried to newly-poured strip as needed. Job used 48,000-sq yd of mats, 8000-ft of Bethlehem Dowel Units.

3 Miles of New Road on U.S. 322

Mapping out the day's operations. Left to right: William Berlanti, contractor; Harold V. Runner, resident engineer, and W. Ralph Eccles, district construction engineer, both of Pa. Dept. of Highways; and Eugene Kohles, carpenter foreman.

In order to provide a better, safer road for the heavy volume of traffic using U.S. 322 between Chester and Concordville, Pa., the Pennsylvania Department of Highways recently called for three miles of relocation in the Concordville area. The new road is virtually free of turns, and its construction included the erection of four bridges and three culverts. Contractor for the project: Berlanti Construction Co., of Harrison, N. Y. The bridge reinforcing, as well as bar mats and dowel units, were supplied by Bethlehem.

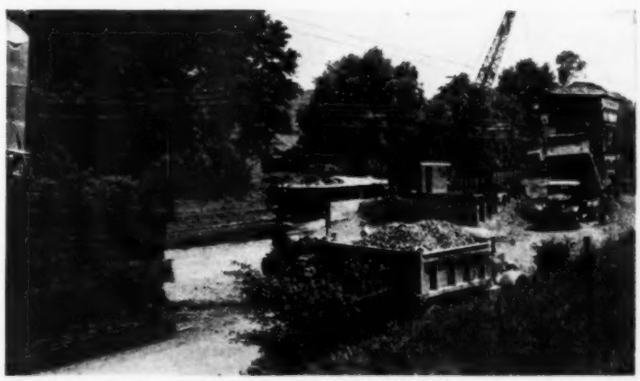
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

STEEL FOR HIGHWAYS

Dowel Units • Reinforcing Bars • Guard Rail Posts
Bar Mats • Guard Rail • Wire Rope and Strand
Hollow Drill Steel • Spikes • Bolts and Nuts • Pipe
Sheet- and H-Piling • Fabricated Structural Steel
Timber Bridge Hardware • Tie-Rods

BETHLEHEM STEEL



Trucks are loaded fast in this well-equipped batching plant adjacent to new road. Note stockpile of Bethlehem Bar Mats at left.

Form setters and fine-grading crew have a job on their hands keeping ahead of the fast-moving paver shown near brow of hill.

One of four bridges in the making. With Bethlehem Reinforcing Bars in place and securely tied, pouring of deck gets under way.

ROADS AND STREETS

January, 1949 • Vol. 92 • No. 1

With Roads and Streets Have Been Combined Good Roads Magazine And Engineering & Contracting

In This Issue

Coming Articles

Construction Superintendent Stuff

Mr. Beuerlein's article in this issue will be followed by other 1948 job reviews. As we noted before here, some contractors really "rolled"! Watch for the dope.

Contracting Problems

Time keeping vs. cost keeping. Another thought-provoking analysis by E. T. Nettleton of Connecticut.

Maintenance and Repairs

Cement slurry mix for undersealing of U.S. 30, Indiana. Research Engineer Goetz of Purdue relates procedure.

Case examples of how states, counties and cities are mechanizing their every-day maintenance chores.

City Streets

Job stories with unusual, interesting pictures of labor-saving methods and devices for quality control.

Aggregate Production

How county-owned mobile crushing plants speed up stabilization of 150 county and township road or street parcels a year. By Otto Hess, Kent County, Mich.

Contractor Whips Storms

The famed "Outer Banks" of North Carolina finally have a modern road. Contractor C. P. Ballenger will tell how it was done.

Earth-Moving

Roadbuilders will have much to learn about earth-moving from experiences at one of the West's large dams. Story with pictures soon.

And Articles on . . . .

Lime stabilization methods; new Texas data . . . Deep pile foundation for secondary bridge . . . Hot-mix jobs (several reports) . . . Airfield topics and projects . . . Bridge jobs . . . Equipment maintenance . . . Snow removal (what's happening this winter) . . . Continued expressway reports.

A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations, and to the construction and maintenance of airports.

Gillette Publishing Company
Publication and Editorial Offices,
22 West Maple Street, Chicago 10, Ill.

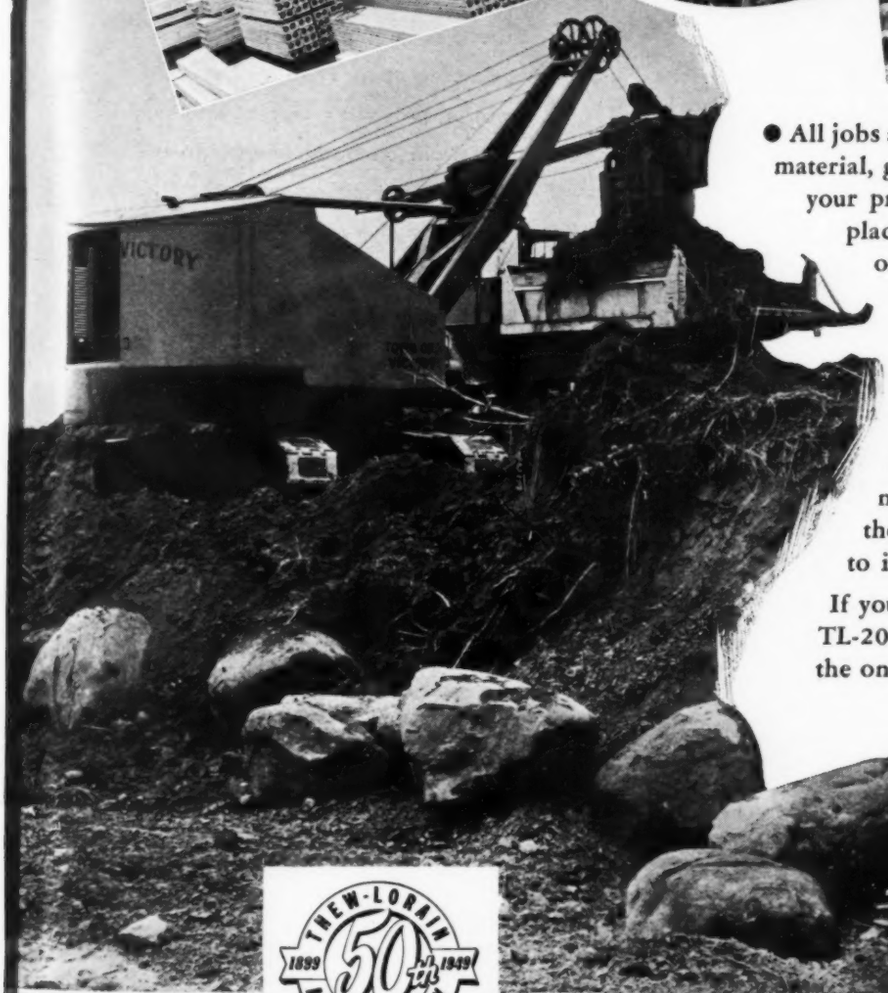
Acceptance under Act of June 5, 1934. Authorized April 16, 1948, at Mount Morris, Illinois. Published monthly. Subscription price $5.00 per year.

The TL·20 offers 50 combinations and 1000 profit possibilities


Single engine, Self-Propelled TL-20 rubber-tire crane.


Dragline mounted on 2-speed Chain Drive Crawler.


Rubber-tire Moto-Crane plus gooseneck hoe boom.



● All jobs are not the same; they vary in conditions, size, material, ground or travel conditions. It's important to your profits to have the right machine in the right place at the right time. That's why the selection of a Lorain TL-20 for today's job is your protection against tomorrow's ever-changing requirements.

With the TL-20 you have the choice of 50 working combinations—10 mountings and 5 interchangeable booms. And, remember, every one is a flexible combination. You can not only switch booms in a jiffy but because of the TL-20's modern Unit Assembly it's possible to interchange mountings as well.

If you're one to plan ahead, plan now to see the TL-20 at your local Thew-Lorain distributor. It's the one high production unit in the ½ yd. class that can fit itself to both today's jobs and those of the future.

THE THEW SHOVEL COMPANY
Lorain, Ohio

THEW-LORAIN 1899 50th ANNIVERSARY 1949

Lorain® Thew TL 20 Lorain

Hercules WD-12 Dump Body, equipped with Hercules 7X "Center-Lift" Hoist. Note integrated underbody construction, with crossmembers and longitudinals welded into a single, exceptionally sturdy unit.

X = { SMOOTH, POWERFUL HOIST ACTION

The HERCULES Type X "Center-Lift" Hydraulic Hoists

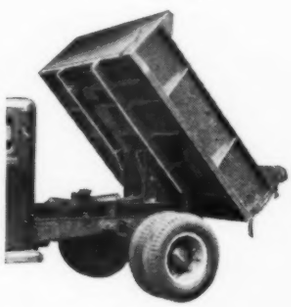
Smooth, powerful lifting action—that's the advantage of the "Center-Lift" principle, pioneered by Hercules and developed to its most efficient stage in the precision-built Hercules Type X Hydraulic Hoist.

Hercules "Center-Lift" provides maximum lifting capacity with minimum use of power, prevents cramping and eliminates strain on body and hinge bolts —features that make your most difficult hauling and dumping jobs easy—and profitable.

Whatever your hauling and dumping problem, you'll find an economical solution in Hercules Hydraulic Hoists and Dump Bodies—engineered for dependable, low-cost performance on any job. Write, outlining your requirements, for complete information.

The Hercules Aircreter, revolutionary new unit for hauling and placing premium-quality, air-entrained concrete, is equipped with a Hercules 8X "Center-Lift" Hydraulic Hoist for fast, clean dumping of concrete.

Hercules Heavy-Duty Dump Body, mounted on six-wheel chassis, with Hercules 8X Hydraulic Hoist. Body, of 10-gauge steel, measures 144" x 84" has a capacity of 8 cubic yards. "Center-Lift" principle, originated by Hercules, insures smooth, easy lifting of large capacity loads.

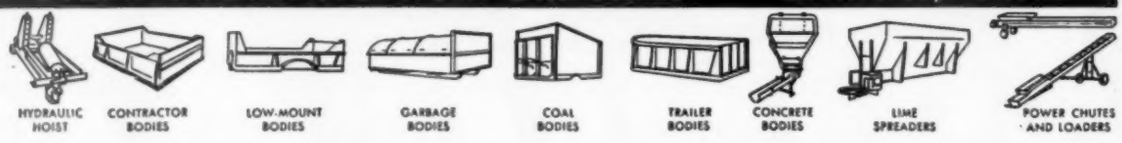


Hercules D-12 Contractor's Body, sturdy unit for all-around work. Pyramid-type enclosed steel side braces and full-length rub rails for maximum strength.

LIFT WITH EASE— USE

Hercules

STEEL PRODUCTS CORPORATION • GALION, OHIO



YOUR 1ST NORTHWEST IS OUR BEST SALESMAN!

Watch a Northwest in the heart of a job like this! Note the smooth crowding action—the ease with which the dipper bites in—the freedom from stuttering. Note the smooth swing and the accurate control of the dipper when spotting. There is no time lost in jockeying for position—it's a full dipper; fast, clean swing and back again, hour after hour. The "Feather-Touch" Clutch Control assures ease of operation without complications and keeps output up. Simple design makes maintenance easy and keeps operating costs down.

It's a real Rock Shovel—built for the heart of the tough jobs. High output, low operating cost and Northwest features have made one out of every three Northwests a repeat order. They are the Money Makers for the Key Spots and you can't afford to have anything but the best in the Key Spots. Plan on a Northwest! Your first Northwest will be our best salesman.

NORTHWEST ENGINEERING CO.
1504 Field Building
135 South LaSalle Street
Chicago 3, Illinois

MAKE YOUR KEY MACHINE A REAL ROCK SHOVEL for the heart of the job!

PROFIT

NORTHWEST

SHOVELS • CRANES • DRAGLINES • SHOVEL-CRANES

TRAXCAVATORS Give You MORE of Everything

MORE WORK . . . MORE UTILITY . . . MORE PROFITS

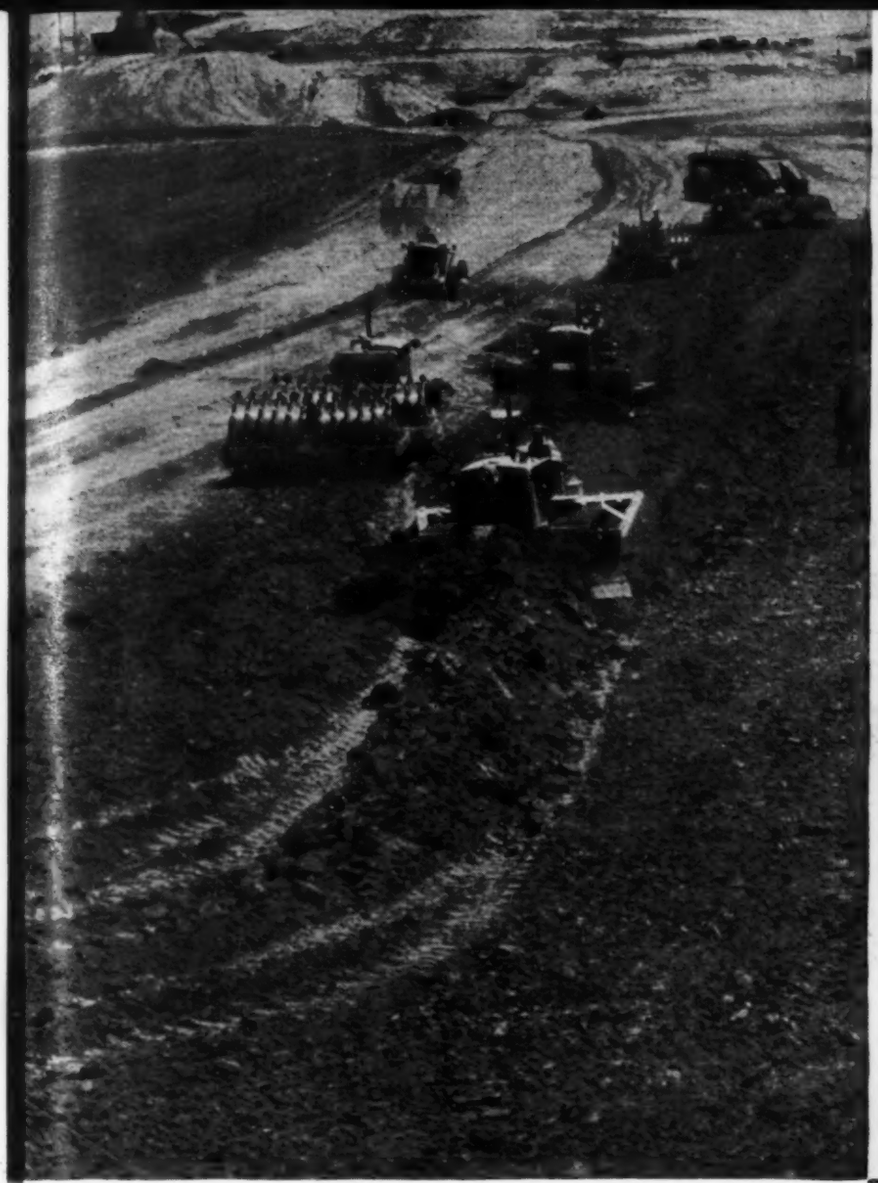
You get more for your equipment dollar with TRAXCAVATORS doing all your digging, loading, carrying and grading work — they have the extra stamina and speed that gets more work done in less time and produces more profits on more jobs. Whether they're excavating basements, grading housing sites or loading trucks with bulk material, TRAXCAVATORS give you maximum efficiency and unlimited versatility at all times — the ability to handle any assignment under the toughest conditions.

TRAXCAVATORS are built in sizes to fit every job and purpose — with bucket capacities from ½ to 2½ cubic yards. Every TRAXCAVATOR is engineered to match the power and speed of the rugged "Caterpillar" track-type tractor on which it's mounted. Bulldozer Blade and ANGLEGRADER attachments are also available to further increase TRAXCAVATOR's usefulness. Call on your TRACKSON-"Caterpillar" dealer for complete details or write to the TRACKSON COMPANY, Dept. RS-19, Milwaukee 1, Wis.

TRAXCAVATOR

REG. U. S. PAT. OFF.

The Original Tractor Excavator



Cherry Creek Dam is a "Caterpillar" Show

Here are a few of the 39 "Caterpillar" Diesel units on the Phelps-Wunderlich-James contract at Cherry Creek Dam.

This "Caterpillar" Diesel No. 12 Motor Grader is doing a grading job on the fill. Cherry Creek Dam project.

"CATERPILLAR" Diesel equipment—39 pieces of it—is at work on the Phelps-Wunderlich-James contract at Cherry Creek Dam, near Denver, Colorado. Not just the earthmoving but everything else, from lighting the job to wetting down the fill, is handled right by the big yellow machines.

Track-type "Caterpillar" Diesel Tractors, with scrapers, 'dozers and sheep's-foot tampers, do the bulk of the earthmoving and compacting. But rubber-tired DW10 Tractors are also there to handle the long hauls and pull the giant sprinklers. No. 12 Motor Graders do the finishing and maintain the haul roads, and a "Caterpillar" Diesel Electric Set supplies power for the lighting that permits 3-shift, 24-hour operation.

Here's an example of the efficient use of standardized, zoned equipment—all of it built by one reliable manufacturer—all serviced by one dependable dealer.

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

CATERPILLAR

REG U S PAT OFF

DIESEL ENGINES • TRACTORS
MOTOR GRADERS
EARTHMOVING EQUIPMENT

Two of A. I. Savin Corporation's four 500′ Blue Brute Portable Air Compressors that are setting an example for dependable service

TOUGH GOING!... BUT BLUE BRUTES ARE TOUGHER!

On jobs like the Boston Post Road relocation project — with rock cuts containing 70,000 yds. in a single pocket — you soon find out what your air equipment can do!

A. I. Savin reports 100% satisfaction from Worthington Blue Brutes. It's easy to see why. Blue Brute 500′ Portable Air Compressors are packed with such advanced features as full force-feed lubrication and easy-breathing Feather* Valves—the most efficient ever made. No wonder these "portable powerhouses" have stood up under long, gruelling service without an extra minute down or an extra cent spent for repairs!

Also, Blue Brute UMW-40 Wagon Drills are the most versatile in the field . . . fast, powerful drilling machines that swing into action at any angle, to make short work of the toughest rock formation!

Adding up, here's a completely dependable air supply and air tools that make the most of it . . . a typical Blue Brute team that is beating schedules the country over. For further details that prove *there's more worth in Worthington,* see your nearby Blue Brute Distributor or write us direct.

*Reg. U. S. Pat. Off.

H8-8

HERE ARE THE FACTS

The A. I. Savin Corporation is using Worthington Blue Brutes to make a fast, economical job of one of the country's most difficult stretches of highway construction — 19,500 ft. straight through rocky, coastal Connecticut terrain on the relocated Boston Post Road.

Savin's Blue Brute 500′ Portable Air Compressors feed a battery of drills, wagon and hand-held. They have supplied air almost continuously for 5,000 hours at full rated capacity — without anything but routine, after-hours servicing!

The Blue Brute UMW-40 Wagon Drills on the project match this performance with consistent drilling through 22 ft. of mixed rock in 10 to 12 minutes!

Making fast speed through mixed rock! One of A. I. Savin's UMW-40 Blue Brute Wagon Drills in action

WORTHINGTON

WORTHINGTON PUMP AND MACHINERY CORPORATION

Worthington-Ransome Construction Equipment Division, Holyoke, Mass.
Distributors In All Principal Cities

BUY BLUE BRUTES

IF IT'S A CONSTRUCTION JOB, IT'S A BLUE BRUTE JOB

Here's the high-speed, rubber-tired

Self-loading

7 Cu. Yd. (9 TON) capacity

Speeds to 25 m.p.h.

Tournapull, Carryall—Trademark Reg. U.S. Pat. Off.

Send for Complete Facts

To: R. G. LeTOURNEAU, Inc., PEORIA, ILL. Please send information on "D" ROADSTER:

☐ Specifications ☐ Price ☐ Delivery ☐ Would like job analysis on present operations

NAME..... TITLE.....

COMPANY..... TYPE OF BUSINESS.....

STREET..... CITY, STATE.....

Would also like information on ☐ 13.3-yard "C" TOURNAPULL ☐ Big 30-yard "B" TOURNAPULL

"D" ROADSTER

... for one-man dirtmoving

100 h.p. DIESEL

(Also available with Gasoline Engine)

Check what this means to you:

This 7-yard "D" ROADSTER combines all the economies of one-man operation with the production ability of bigger-capacity, electric-control Tournapulls. It's highly mobile and small enough to put your odd jobs and utility dirt-moving on a profitable basis . . . yet, has ample load capacity, fast hauling speeds and every exclusive operating feature you need for fleet operation on production dirtmoving.

Strips overburden; works gravel pits; loads, hauls, spreads surfacing; builds, maintains access, haul roads; digs stockponds; levels building sites. Ideal for terracing, drainage, railroad maintenance. Highly profitable for fill-in work, such as stockpiling coal, chemicals, around factories and utilities during off-season. Makes fast, self-powered moves job-to-job, over pavement or cross country . . . no trailer or haul equipment needed.

Try one . . . you'll find it so handy . . . so profitable . . . you'll want more . . . write or see your LeTourneau Distributor TODAY.

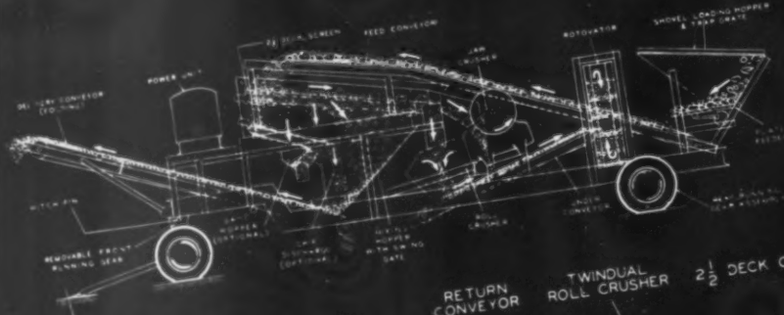
- ✓ **5 speeds forward to 25 m.p.h.**
- ✓ **Finger-tip electric control**
- ✓ **Positive, 2-speed, power steer**
- ✓ **Power-proportioning differential**
- ✓ **Heavy-duty transmission, Sliding gear type**
- ✓ **4-wheel brakes,** *3184 sq. in. braking surface*
- ✓ **Gauge, center to center, of Carryall tires, 5' 11"**
- ✓ **Width cutting edge 7' 0"**
- ✓ **Four 14.00x32, 12-ply tires**
- ✓ **Weighs approx. 20,700 lbs.**

LETOURNEAU PEORIA, ILLINOIS — HIGH-SPEED RUBBER-TIRED — **TOURNAPULLS**

MORE WORK PER HOUR WITH RUBBER-TIRED POWER

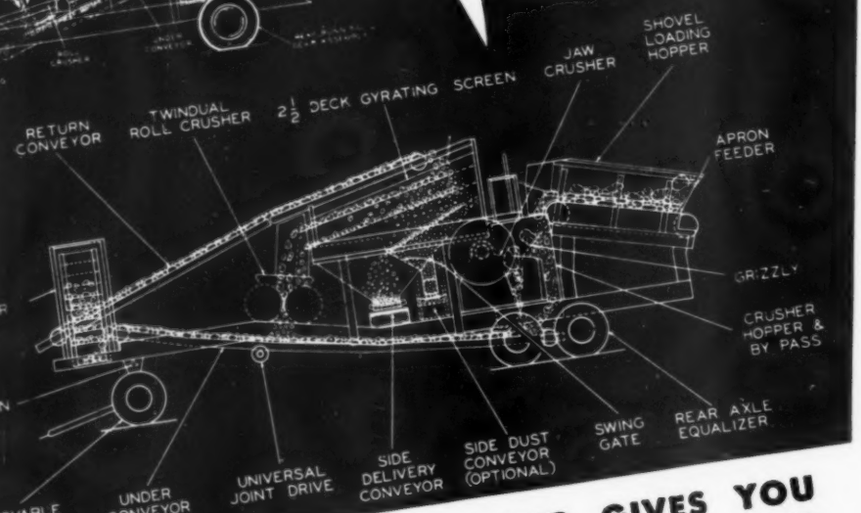
Check these UNIVERSAL DESIGN FEATURES that will give you more profits

The UNIVERSAL 880 GRAVELMASTER



Built in 4 sizes with capacities from 35 to 200 yards of 1" per hour depending on actual amount of crushing.

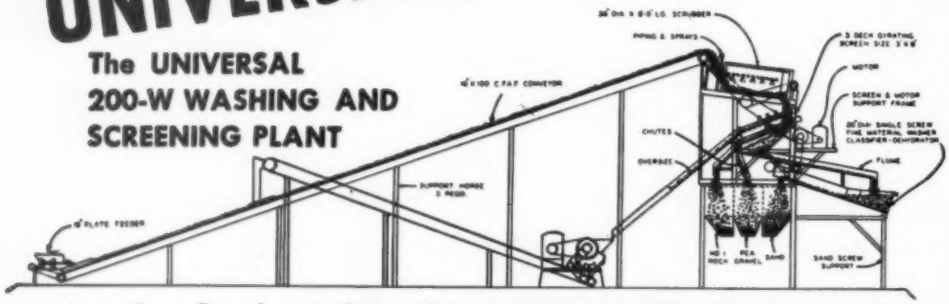
The UNIVERSAL 293-Q PACEMAKER



Three stages of reduction with two crushers give capacity to tackle largest jobs—portability to handle small jobs profitably. Two sizes, capacities to 125 cubic yards of 1" per hour.

UNIVERSAL "STREAM-FLO" ENGINEERING GIVES YOU MORE YARDS PER HOUR AT LESS COST PER YARD

The UNIVERSAL 200-W WASHING AND SCREENING PLANT



For volume production of clean aggregate, washed and screened to 3 sizes. Capacity: 100-135 tons per hour.

Depend upon UNIVERSAL for top economy and low cost production. All UNIVERSAL plants are "Stream-Flo" engineered to provide the perfect balance of high capacity units to assure a steady flow of properly graded material. No bottlenecks to cut into profits. Roller bearings throughout mean economical, smooth and quiet operation.

Yes, check and compare . . . and you'll see why UNIVERSAL sets the pace in engineering and field performance. Write for information.

The UNIVERSAL ENGINEERING CORPORATION

A division of PETTIBONE MULLIKEN CORPORATION • New York • Chicago

632 C AVENUE N. W. • CEDAR RAPIDS, IOWA

Designers and builders of stationary and portable "Stream-Flo" Rock, Gravel, and Lime Plants, Screening and Washing Plants—Conveyors—Apron Feeders

Other Pettibone Mulliken Products . . .
PUMPS, CLAMSHELL AND DRAGLINE BUCKETS, SPEED LOADERS, SNOW LOADERS, CONVEYORS OF ALL KINDS, CAR UNLOADERS

"My FORD is the BEST truck I ever OWNED"

Roadside Report

FORD Bonus Built TRUCKS

IVAN HOBBS

FINDLAY, OHIO

"MY F-7 FORD dump truck has already given me 7,000 miles of top service, and I haven't babied it either," reports Ivan Hobbs who uses his truck in construction work in the Findlay, Ohio area.

"My usual load is 18,000 lbs. of crushed stone and my hauls are under all kinds of conditions. My Ford is the best truck I ever owned and I bought it because my previous Ford Trucks lasted longer and cost me less to operate."

Thus does Mr. Hobbs add his voice to a nationwide chorus of Ford Truck enthusiasts. Truck users everywhere are pepped up about Ford Truck performance. They love the luxury of the new Ford Million Dollar Cab. And they get the biggest bang out of Ford Bonus Built construction . . . the superstrong construction that contributes to long truck life. Life insurance experts prove Ford Trucks last longer.

ONLY THE FORD BIG JOB HAS ALL THESE FEATURES!

- ★ New 145-h.p. Ford V-8 engine for top performance.
- ★ Ford exclusive concentric dual-throat carburetor for more power, more economy.
- ★ New heavy duty 5-speed transmissions for operating flexibility.
- ★ Big Ford 16-inch by 5-inch rear brakes in the F-8; 16½-inch by 3½-inch in the F-7.
- ★ Ford Super Quadrax 2-speed axle with vacuum shift for performance flexibility in Model F-8 (single speed axle also available); single-speed Quadrax Hypoid Axle in Model F-7.
- ★ Large diameter (10-inch) wheel bolt circle with 8 studs to allow for extra-strong hub construction.
- ★ Million Dollar Cab with Ford Exclusive Level Action suspension for greater driving comfort.
- ★ Nationwide service from over 6,400 Ford Dealers.
- ★ Ford Bonus Built construction for long truck life.

Gross Vehicle Weight Ratings: F-8 up to 21,500 lbs., F-7 up to 19,000 lbs. Gross combination ratings: F-8 up to 39,000 lbs., F-7 up to 35,000 lbs.

FORD 1948 *Bonus Built* **TRUCKS** 1953

BUILT STRONGER TO LAST LONGER

USING LATEST REGISTRATION DATA ON 5,444,000 TRUCKS, LIFE INSURANCE EXPERTS PROVE FORD TRUCKS LAST LONGER!

Only 27 lbs.

But Look at the Performance You Get

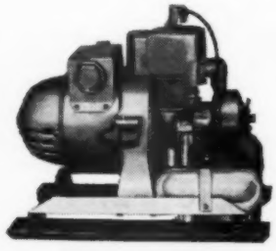
When very accurate cuts are necessary a helper's handle is easily attached to insure precise cuts at any angle.

Small, compact and easily handled, the Homelite Chain Saw gets in and cuts where larger saws are unworkable.

Here, for the first time, is a small saw that does the work of a big saw . . . a modern, high cycle electric chain saw that can be handled by one man with complete ease. Extremely fast and efficient, this saw cuts heavy timber and trees up to 36" diameter in amazingly low time. And because of its light weight . . . only 27 lbs. complete . . . it is easily operated no matter where your cutting is necessary.

Another important point, with a Homelite Chain Saw you get *electric* chain saw efficiency everywhere . . . even in remote locations . . . for you operate your Homelite Chain Saw with a Homelite Dual Purpose Generator, a *carryable* generator that can be picked up and easily transported to any job at any location.

Your Power Unit For a Plus Performance



A Homelite Dual Purpose Generator is really a *multi-purpose* generator. You can use it not only for your Homelite Chain Saw but for operating both high cycle and standard universal 110 volt tools plus floodlights on emergency night work.

See how this is done. Write, today, for our new Homelite Chain Saw bulletin.

HOMELITE

CORPORATION

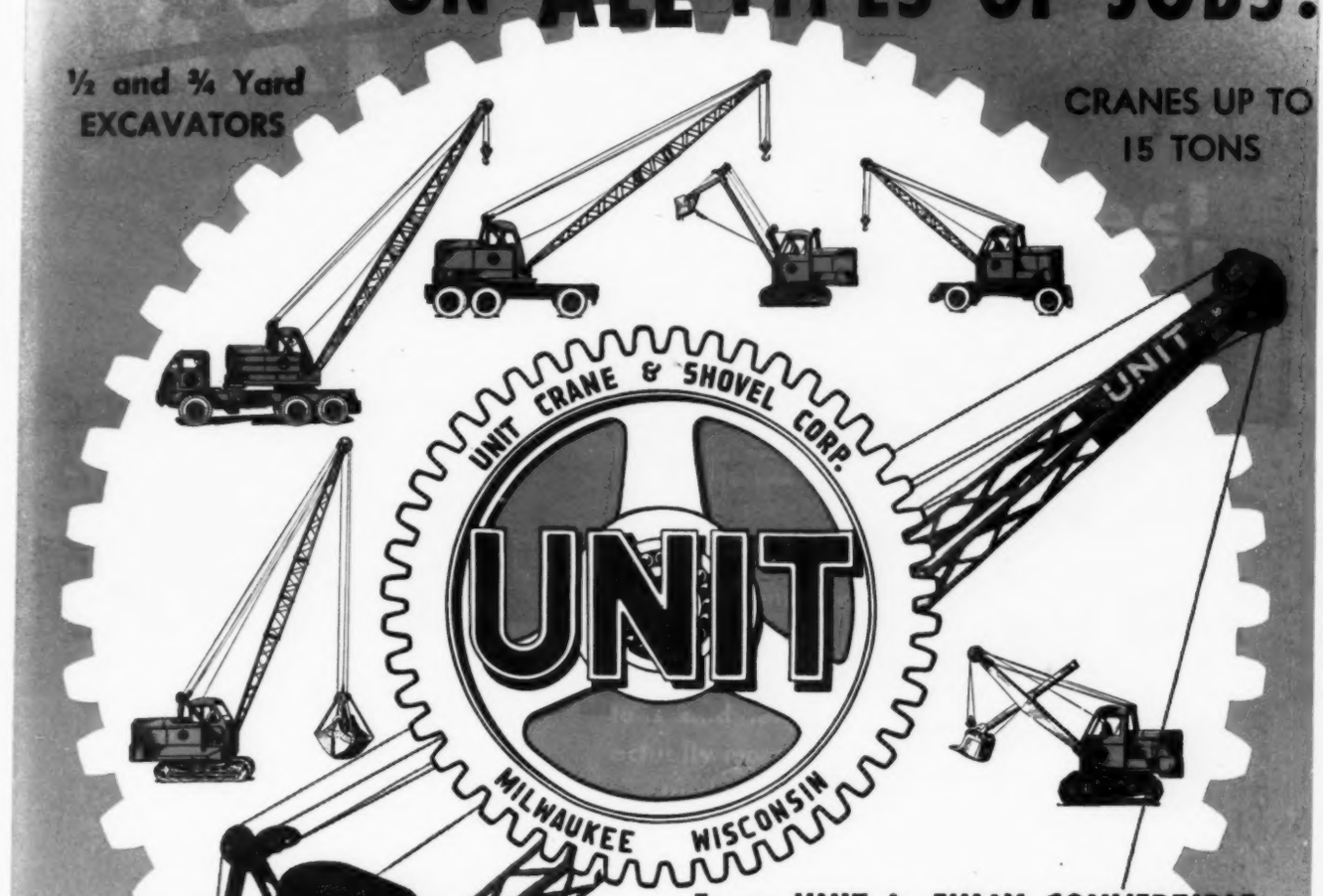
901 RIVERDALE AVENUE, PORT CHESTER, NEW YORK

Super Service

ON ALL TYPES OF JOBS!

½ and ¾ Yard EXCAVATORS

CRANES UP TO 15 TONS



Every UNIT is FULLY CONVERTIBLE

Regardless of whether your job calls for a shovel, clamshell, magnet, dragline, trenchoe, grapple or backfiller, a UNIT machine easily "fills the bill"! For UNIT is convertible to ANY attachment and gives an excellent account of itself on ALL types of service. The change from one attachment to the other can easily and quickly be made on the job, by any ordinary mechanic. UNIT exclusive features include: Automatic traction brakes... Disc type clutches... One-piece cast gear case and above all, UNIT's safety-promoting FULL VISION CAB.

You can tell it's a UNIT by the FULL VISION CAB. There's no other cab like it.

UNIT CRANE & SHOVEL CORP. 6407 WEST BURNHAM STREET MILWAUKEE 14, WIS., U.S.A.

LOWER YOUR LOADING COSTS

A truly modern loader that incorporates the latest and best ideas in design, function and control. Conveyorized discharge chute permits lower overhead clearance (11'9"), and speedier handling of material.

IT DOES THIS

Gets from job to job at *truck* speed.

Handles any loose material quickly and economically.

WITH THESE

One man operation.

Hydraulic control.

Capacity—3 to 5 cu. yds. per minute.

Positive chain crowd.

Mounts on any standard 1½ or 2 ton truck chassis.

Self feeding augers feed material constantly, efficiently, into 20" buckets.

•

Write for further information and name of your distributor.

EAGLE

JAW CRUSHERS • IMPACT BREAKERS
PULVERIZERS • CONVEYORS • LOADERS

EAGLE CRUSHER CO., *Inc.* GALION OHIO·U·S·A

EATON
2-Speed Truck
AXLES
Pay for Themselves!

Eaton 2-Speed Axles not only add to motor truck utility and performance, but they actually effect important savings in operating and maintenance costs and add materially to vehicle life. Because Eaton 2-Speed Axles provide the right gear ratio for every road and load condition, engines may be run in their most efficient and economical speed range. Stress and wear on major vehicle parts are held to a minimum. On most trucks of 1½ tons and larger, Eaton 2-Speed Axles will actually *more than pay for themselves.* See your truck dealer for complete information.

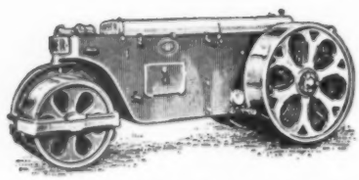
More Than a Million Eaton 2-Speed Axles in Trucks Today

Axle Division
EATON MANUFACTURING COMPANY
CLEVELAND, OHIO

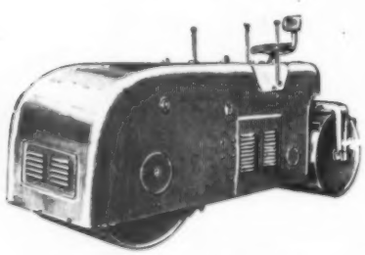
OTHER EATON PRODUCTS

FOR DEPENDABLE ALL-YEAR-ROUND PERFORMANCE ON MANY JOBS . . .

THE HUBER MAINTAINER IS YOUR BEST BUY



HUBER 3-WHEEL ROLLERS
4 models — 4 to 12 Tons



HUBER TANDEM ROLLERS
5 models — 3 to 14 Tons

Lick your year-round maintenance problems with the Huber Maintainer. It's a versatile and dependable machine—built to handle every phase of highway, road, street, and airport maintenance at savings to you! The Huber Maintainer with its hydraulically operated auxiliary units is readily adaptable for service as a bulldozer, patch roller, lift loader, snow plow, rotary broom or berm leveler. Ask any experienced operator about the Maintainer! He'll speak well of Huber's advanced design . . . rugged "engineered" construction . . . rigid material specification . . . and other manufacturing skills that add up to dollar savings and longer years of trouble-free service for you.

Remember, too, that Huber's complete line of road machinery—3-wheel rollers . . . tandem rollers . . . trench rollers has for years been a standard in the construction field. See a Huber before you buy any road machinery. Write today for descriptive bulletins and name of dealer nearest you.

HUBER

THE HUBER MFG. COMPANY
Marion, Ohio, U.S.A.

HUBER *3 Wheel • Tandem* **ROAD ROLLERS** *and* **MAINTAINERS**

TOUGH JOBS MOVE FASTER with GM DIESELS

Mammoth O'Sullivan Dam (formerly called Potholes Dam) took more than 9 million cu. yds. of earth and rock fill. Toughest hauls on this rugged project were assigned to 22 GM Diesel-powered Euclid bottom dumps in the fleet owned by contractors Lytle, Amis and Green. Six-mile round trips—with half the distance on an 8% grade—were completed in an average of 23 minutes, including loading time.

ALL OVER the country you see General Motors Series 71 2-cycle Diesels taking over the hard jobs and setting records for speedy completions.

In this case, on the 8% down-grade at O'Sullivan Dam, *braking capacity* of the engine was just as important to the contractors as "power at every downstroke." Full compression braking makes the GM Diesel powered "Eucs" easier on brakes and linings.

These 2-cycle Diesels also deliver high torque that gives trucks and tractors fast get-away and smooth up-grade pull even with a punishing load.

Add these advantages to their low fuel costs and their exceptional dependability, and you have some of the reasons contractors everywhere are saying, "We pick GM Diesels for our toughest assignments."

Before you specify power for any equipment, get all the facts. Call your local GM Diesel dealer, or write us direct.

DETROIT DIESEL ENGINE DIVISION

SINGLE ENGINES · Up to 200 H.P. **DETROIT 28, MICHIGAN** MULTIPLE UNITS · Up to 800 H.P.

GENERAL MOTORS

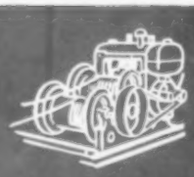
GM GENERAL MOTORS DIESEL POWER

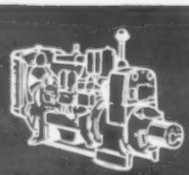
DIESEL BRAWN WITHOUT THE BULK

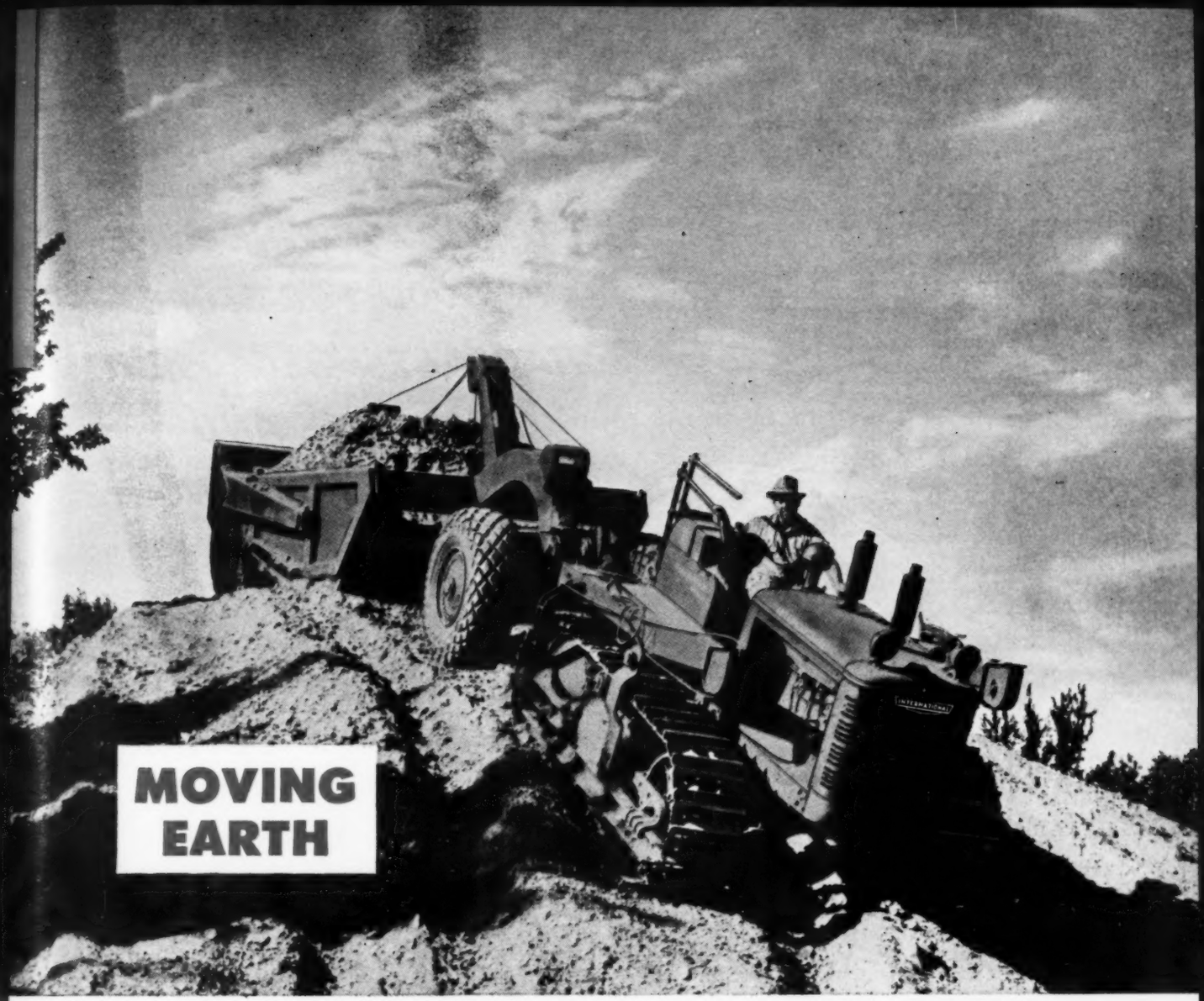
POWER!

CRAWLER TRACTORS
POWER UNITS
DIESEL ENGINES
WHEEL TRACTORS

INTERNATIONAL





INTERNATIONAL ENGINES — **powering tractors or power units—deliver rugged, low-cost power that cuts operating costs to rock bottom.**

Producing aggregate the International UD-18A is one of three International Power Units driving a rock crusher. The low operating cost of these power units is an important factor in profitably meeting the competitive price of crushed stone.

Moving earth to clear the way for a hospital addition is the task of the International TD-18 Diesel Crawler and matched scraper. Averaging 120 yards per hour, the TD-18 did a fast, profitable job of moving a total of 10,000 yards.

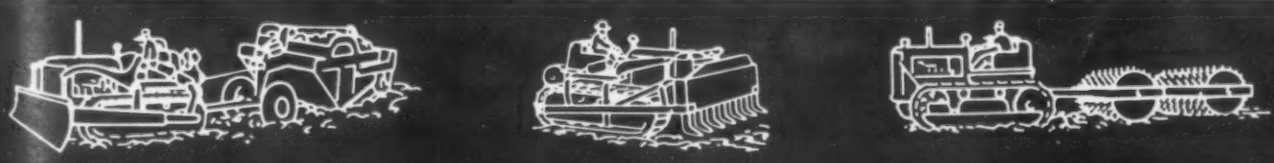
You just can't beat International Power for peak production and low operating and maintenance costs. Visit your International Industrial Power Distributor and let him show you how International Tractors and Power Units will produce more profits on your projects.

INTERNATIONAL HARVESTER COMPANY • CHICAGO

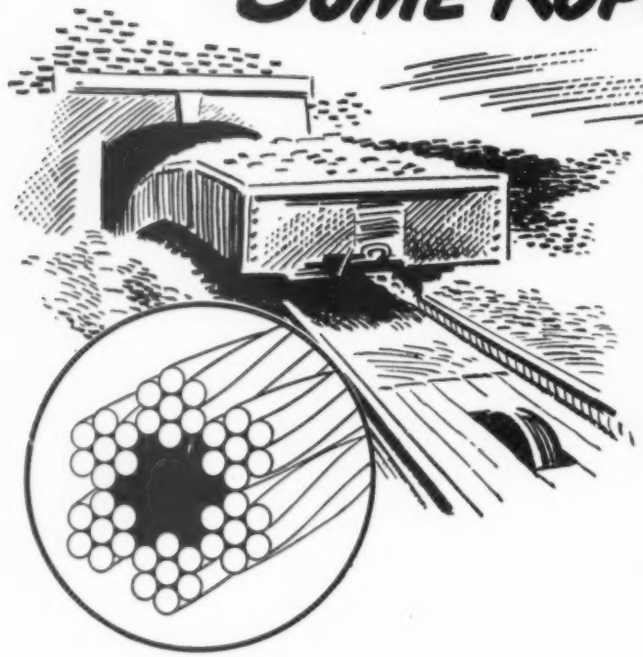
Listen to James Melton on "Harvest of Stars" every Wednesday evening—CBS

INTERNATIONAL HARVESTER

Industrial Power

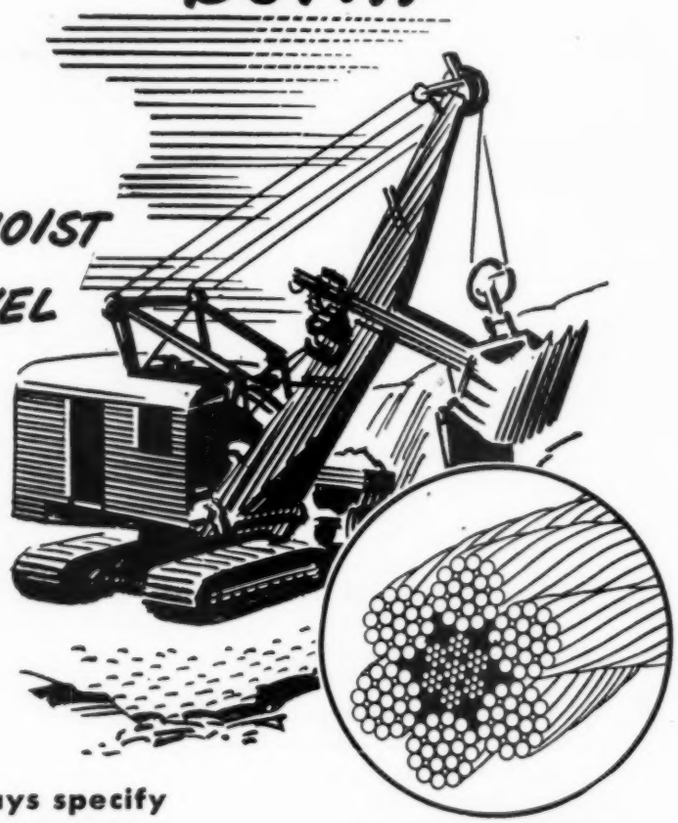


SOME ROPES FOOL YOU



U-W 6x7 WIRE ROPE IS GOOD FOR SLOPE HAULAGES BECAUSE IT IS COARSE AND RESISTS ABRASION —

BUT...



FOR BOOM FALLS AND HOIST ROPES ON A POWER SHOVEL IT'S TOO STIFF. HERE WE RECOMMEND USING U-W 6x19 FILLER WIRE CABLE WHICH IS MUCH MORE FLEXIBLE

For longest and best service, always specify
U-W LAYRITE (*Preformed*) **IMPROVED PLOW STEEL**

We invite you to let UPSON-WALTON engineer your tough rope jobs.

THE UPSON-WALTON COMPANY

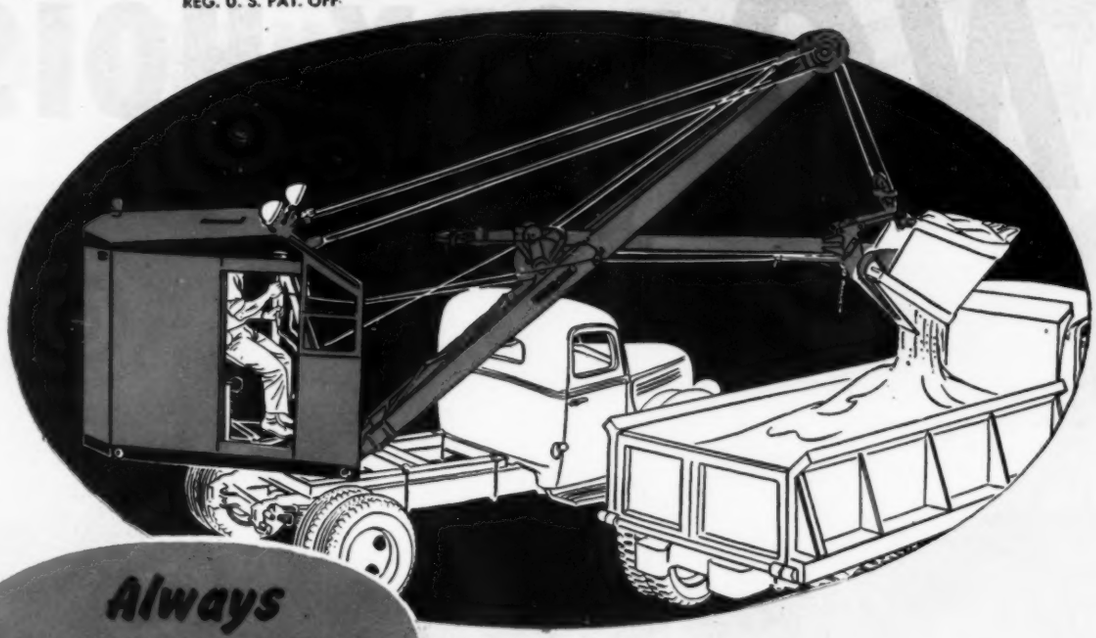
Manufacturers of Wire Rope, Wire Rope Fittings, Tackle Blocks, Brattice Cloth

Main Offices and Factory: Cleveland 13, Ohio

114 Broad Street, New York 4 | 3525 West Grand Ave., Chicago 51 | 241 Oliver Building, Pittsburgh 22

"QUICK-WAY" TRUCK SHOVELS

REG. U. S. PAT. OFF.



Always DEPENDABLE

Yes, "*QUICK-WAYS*" are dependable—and economical, quick and profitable to you. "*QUICK-WAY'S*" accurate balance and strength with light weight permit higher travelling and working speeds, more yardage per day. Simplicity of design and quality steel construction give longer working life, lower operating and maintenance costs, lower initial cost and easier servicing. There's a "*QUICK-WAY*" owner near you, ask HIM.

1 **Wherever a truck can go, and at truck speed, that's where you can take a "*QUICK-WAY*." Low center of gravity and proper balance does it.**

2 **Speed on the job moves more material per day at less cost—a "*QUICK-WAY*" gets around *fast*.**

3 **First in the field and still the leader, "*QUICK-WAYS*" have gotten around more and longer than any other truck mounted power shovel.**

Service available from our distributors strategically located throughout the United States and worldwide

Model E: 4/10 cu. yd. cap., for mounting on any standard 5-ton truck.
Model J: 1/4 cu. yd. cap., for mounting on any standard 1½-ton truck.

"QUICK-WAY"

For speed, portability, economy of operation, and adaptability to a wider range of jobs, nothing of comparable size equals a "Quick-Way" Truck Shovel.

"QUICK-WAY" TRUCK SHOVEL CO.

DENVER, COLORADO

NO BODY-HOIST

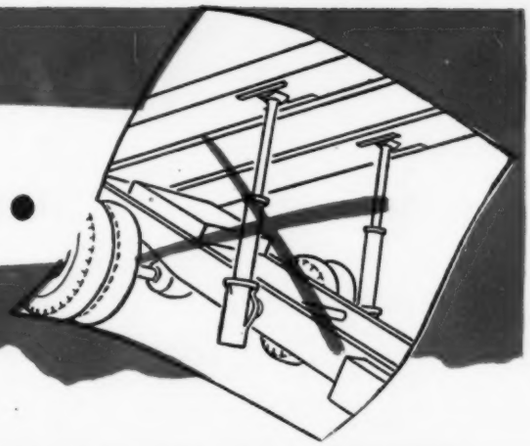
1-Second Gravity Dump saves 15 to 25 seconds over slow-raising body hoists. At 16 trips per hour, 20 seconds dumping time saved each cycle add up to 5.3 minutes, or, 9% more haul-time every hour.

Team DUMPTORS with KOEHRING EXCAVATORS for lowest costs . . .

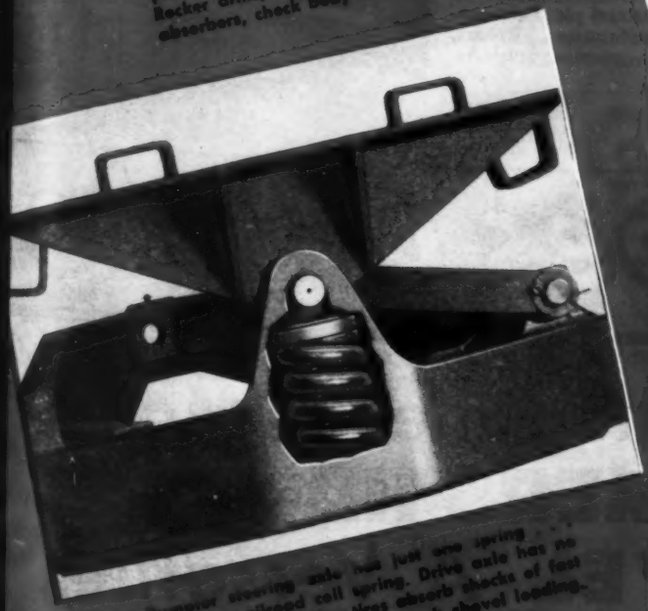
Koehring's "complete package" of heavy-duty excavators and Dumptors offers you consistent savings on both excavating and hauling. 4 rugged sizes assure top output in every shovel class: ½-yard 205, and ¾-yard 304 (illustrated), available on crawlers or rubber . . . big 1½-yard 605 and 2½-yard 1005. It pays to standardize on Koehring.

KOEHRING HEAVY DUTY

ST MAINTENANCE....



Dumptor's gravity-dump system is extremely simple. 6-yd. body rolls on heavy-duty rockers. Rocker arms, and snub chains attached to shock absorbers, check body at approximately 70° tilt.



Dumptor steering axle has just one spring . . . a double railroad coil spring. Drive axle has no springs . . . big drive tires absorb shocks of fast haul road travel . . . and rough shovel loading.

KOEHRING DUMPTORS

haul more yards per shift at less cost per yard because they have no slow-working body hoists. Operator trips release lever and gravity dumps the load in 1 second. There are no hoist maintenance delays . . . no hoist replacement parts to eat into work-time or profits. Koehring gravity dump is instantaneous and trouble-free in all temperature extremes . . . never balks . . . never wears out.

NO COSTLY SPRING MAINTENANCE...

You also save spring maintenance time and spring replacement costs because heavy-duty Dumptors have only one big double-coil chassis spring, on the steering axle. That's all . . . none on the drive axle. Big, shock-absorbing 16.00 x 24 tires eliminate need for more.

Add up all *your* body hoist and spring maintenance costs for a year . . . see how much you'll save with Koehring heavy-duty Dumptors. Find out, too, how Dumptor's no-turn shuttle haul . . . constant-mesh transmission . . . and 3-speed travel forward and reverse, can increase *your* production and profits. See your local Koehring distributor *today!*

DUMPTOR-Trademark Reg. U. S. Pat. Off. K907

KOEHRING COMPANY
Milwaukee 10, Wis.

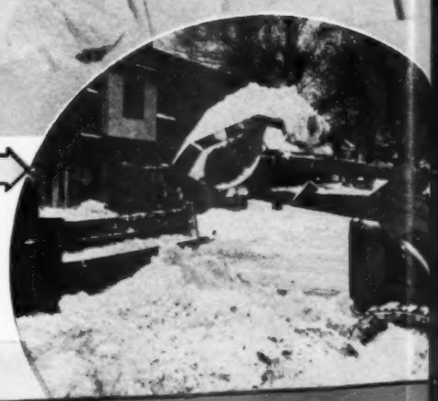
SUBSIDIARIES: PARSONS • JOHNSON • KWIK-MIX

NOW IT'S A SNOWPLOW

Plenty of traction and power combined with greater maneuverability make it the ideal outfit for plowing snow from narrow roads, streets, alleys, parking lots, many other places.

NOW A SNOW LOADER

Quickly picks up and loads snow into trucks from wherever snow has to be removed — industrial plants, cemeteries, airports, institutions, streets, alleys, parking lots, gasoline stations.



For All Types of Jobs t

Interchangeable Attachments Make The **ALLIS-CHALMERS HD-5*** and **TRACTO - SHOVEL** *A Versatile, Money-Saving, All Season Producer*

The ATTACHMENTS

- 1 Cu. Yd. Standard Bucket.
- ¾ Cu. Yd. Narrow Bucket.
- 2 Cu. Yd. Snow Loader Bucket.
- 1 Cu. Yd. Rock Bucket.
- Teeth For All Buckets.
- Heavy-duty Bulldozer Blades — narrow and wide.
- V-type Snowplow.

*HD-5 weighs 11,250 lbs. . . . provides 40.26 drawbar hp., 50.25 on belt

FOR Dirt

NOW IT'S A SHOVEL

Digs basements, loads surplus material into trucks from roads and streets, loads from stockpiles — sand, gravel, crushed rock, etc. . . . for all kinds of excavating and fill work, numerous loading jobs and crane work.

NOW A BULLDOZER

Equipped with a heavy-duty blade, backed by ample traction and power, has the ability to excavate in tough going, backfill, handle all kinds of leveling work.

s the Year 'Round

Here's an outfit that brings you an income throughout the year. No need to put it away in the winter and wait for spring. When the dirt and material handling season ends you simply take off the bucket or bulldozer and quickly attach a snowplow or snow bucket—depending on the job to be done.

In every community, large or small, and in the country, there are countless snow removal jobs just made to order for this outfit.

Get all the facts from your Allis-Chalmers dealer . . . start earning a year around income NOW!

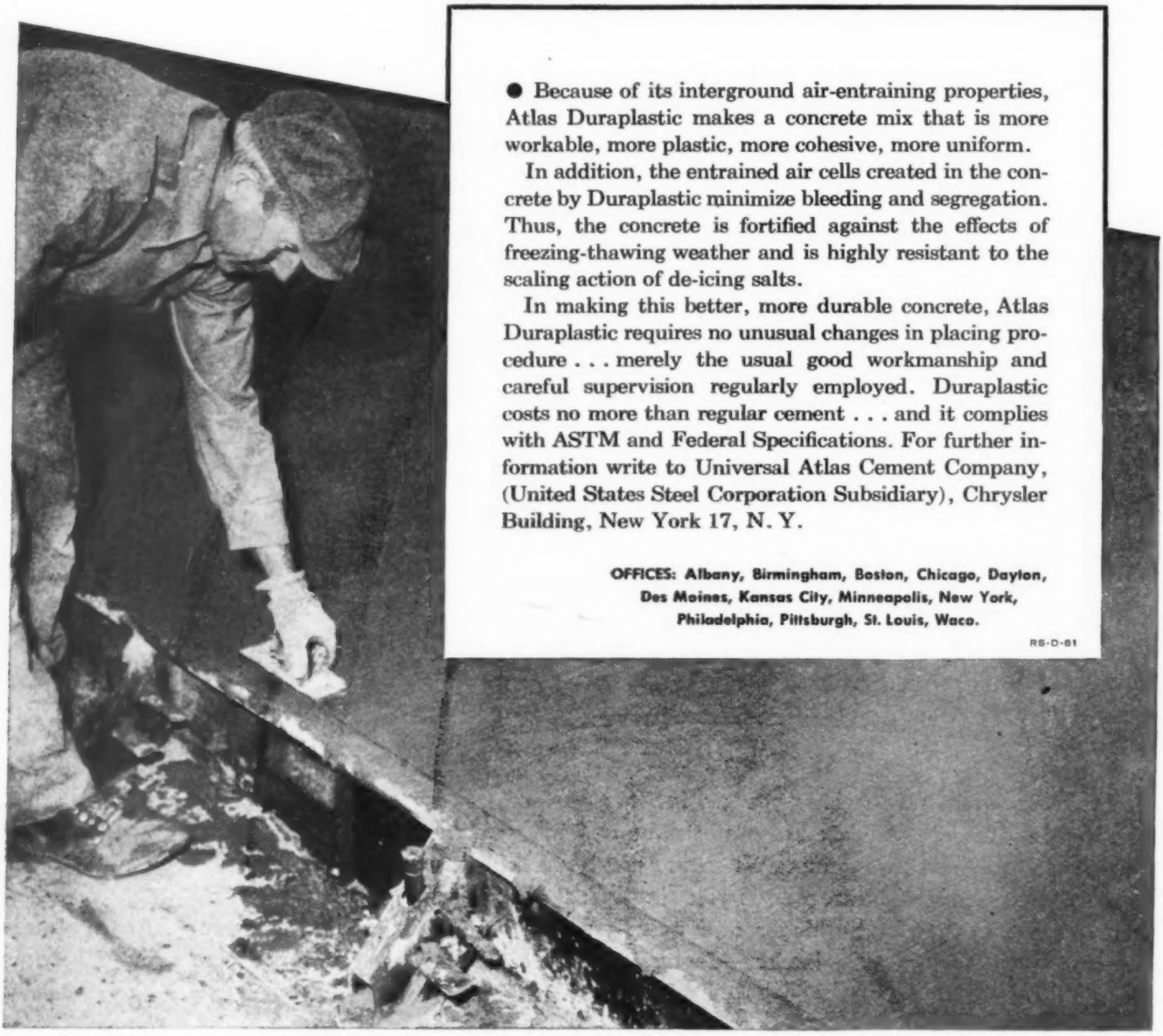
Not Tied Down To Specialized Duty — Yet Gives Special Performance On Every Job

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

DURAPLASTIC makes

better concrete...without change in usual procedure



● Because of its interground air-entraining properties, Atlas Duraplastic makes a concrete mix that is more workable, more plastic, more cohesive, more uniform.

In addition, the entrained air cells created in the concrete by Duraplastic minimize bleeding and segregation. Thus, the concrete is fortified against the effects of freezing-thawing weather and is highly resistant to the scaling action of de-icing salts.

In making this better, more durable concrete, Atlas Duraplastic requires no unusual changes in placing procedure . . . merely the usual good workmanship and careful supervision regularly employed. Duraplastic costs no more than regular cement . . . and it complies with ASTM and Federal Specifications. For further information write to Universal Atlas Cement Company, (United States Steel Corporation Subsidiary), Chrysler Building, New York 17, N. Y.

OFFICES: Albany, Birmingham, Boston, Chicago, Dayton, Des Moines, Kansas City, Minneapolis, New York, Philadelphia, Pittsburgh, St. Louis, Waco.

RS-D-81

ATLAS DURAPLASTIC

TRADE MARK REG. U. A. C. CO.

AIR-ENTRAINING PORTLAND CEMENT

MAKES BETTER CONCRETE AT NO EXTRA COST

"THE THEATRE GUILD ON THE AIR"—*Sponsored by U. S. Steel Subsidiaries—Sunday Evenings—ABC Network*

NORTH • EAST • SOUTH • WEST • IT'S SCHRAMM!

CHOOSE . . . as others have — THE MODEL THAT BEST FITS YOUR NEEDS!

There's a Schramm Air Compressor, size and model, to meet your specific needs!

Below are listed nine of the many Schramm models, portables ranging from 20 to 420 cu. ft. of actual air, the stationary ranging from 2 to 600 cu. ft. displacement.

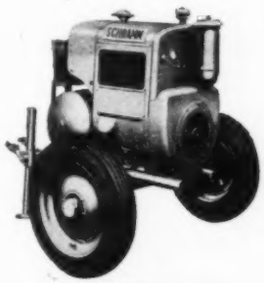
On all models performance records are evidence of their high quality. You will find the name Schramm written on every important page in compressor history.

Features you get in Schramm are: 100% water cooled, assuring ideal performance summer and winter; mechanical intake valve, forced feed lubrication, and electric-starter starting. All Schramms are compact, lightweight, easy to operate.

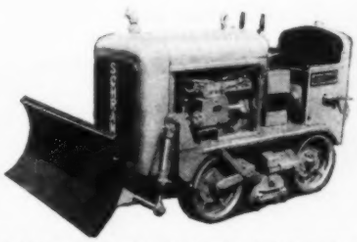
We invite you to write today for fully illustrated catalog describing in detail each of the Schramm Air Compressors shown here . . . plus a wide range of other models. We feel the Schramm story is a good one, and offers you a sure way to get your many compressed air jobs done quickly, efficiently, and economically.

SCHRAMM INC.

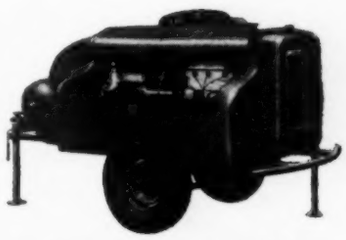
THE COMPRESSOR PEOPLE . WEST CHESTER . PENNSYLVANIA



20/35 Model Compressor

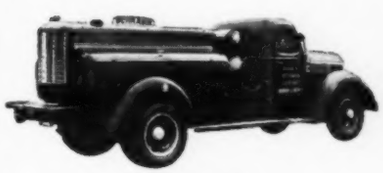


Self-Propelled with Hydraulic Backfill Blade

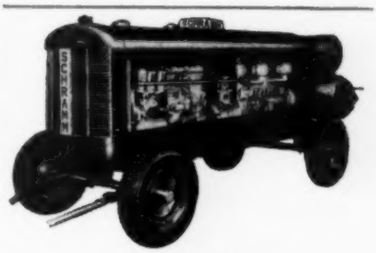


Two-Wheel Trailer Mounting with Tool Boxes

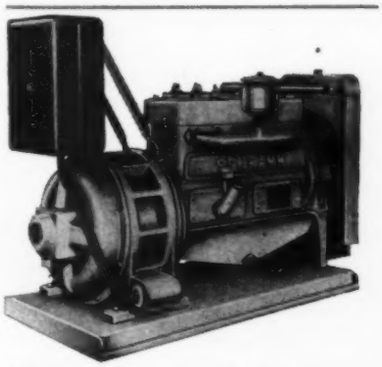
Skidded for Truck Mounting



Truck Mounted

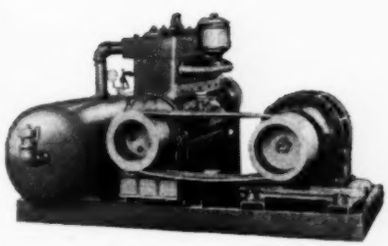


Diesel Engine Drive



Built-in Motor Drive with Cooling Unit and Starter

"V" Belt on Flat Pulley Drive



"V" Belt Drive with Air Receiver

ATLAS SNOW DOZERS

AVAILABLE FOR THE FOLLOWING TRACTORS

FARMALL-CUB
MASSEY-HARRIS PONY
ALLIS-CHALMERS MODEL G
INTERNATIONAL SUPER A AND AV

Provides a fast, easily operated method of clearing snow from sidewalks, barnyards, alleys, lanes or other areas where the use of large snow plows is impractical. Also available for these tractors are Atlas bulldozers and scrapers. Operated either by hand control or hydraulic power.

SECOND CARLOAD SHIPMENT IN ONE MONTH TO THE SAME DEALER.

Every village, town, country and city needs Atlas Snow Dozers for light tractors.

Available now for immediate shipment.

DEALERS WRITE FOR PRICES AND SPECIFICATIONS.

"ATLAS MOVES THE EARTH"

ATLAS SCRAPER & ENGINEERING CO. 6203 MAYWOOD AVE. BELL, CALIFORNIA

PERFECTION

Photo shows a PERFECTION No. 354 Dump Body

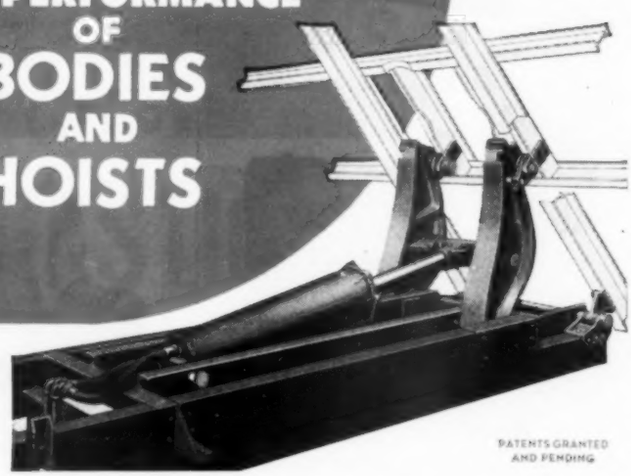
Equipped with PERFECTION ISO-DRAULIC ROLL-A-LIFT

EXCLUSIVE TRADE MARK REG. U. S. PAT. OFF.

Write for complete information.

THE PERFECTION STEEL BODY COMPANY
Galion, Ohio, U. S. A.

IS THE NAME TO *Remember* FOR *LEADERSHIP* IN DESIGN CONSTRUCTION & PERFORMANCE OF BODIES AND HOISTS

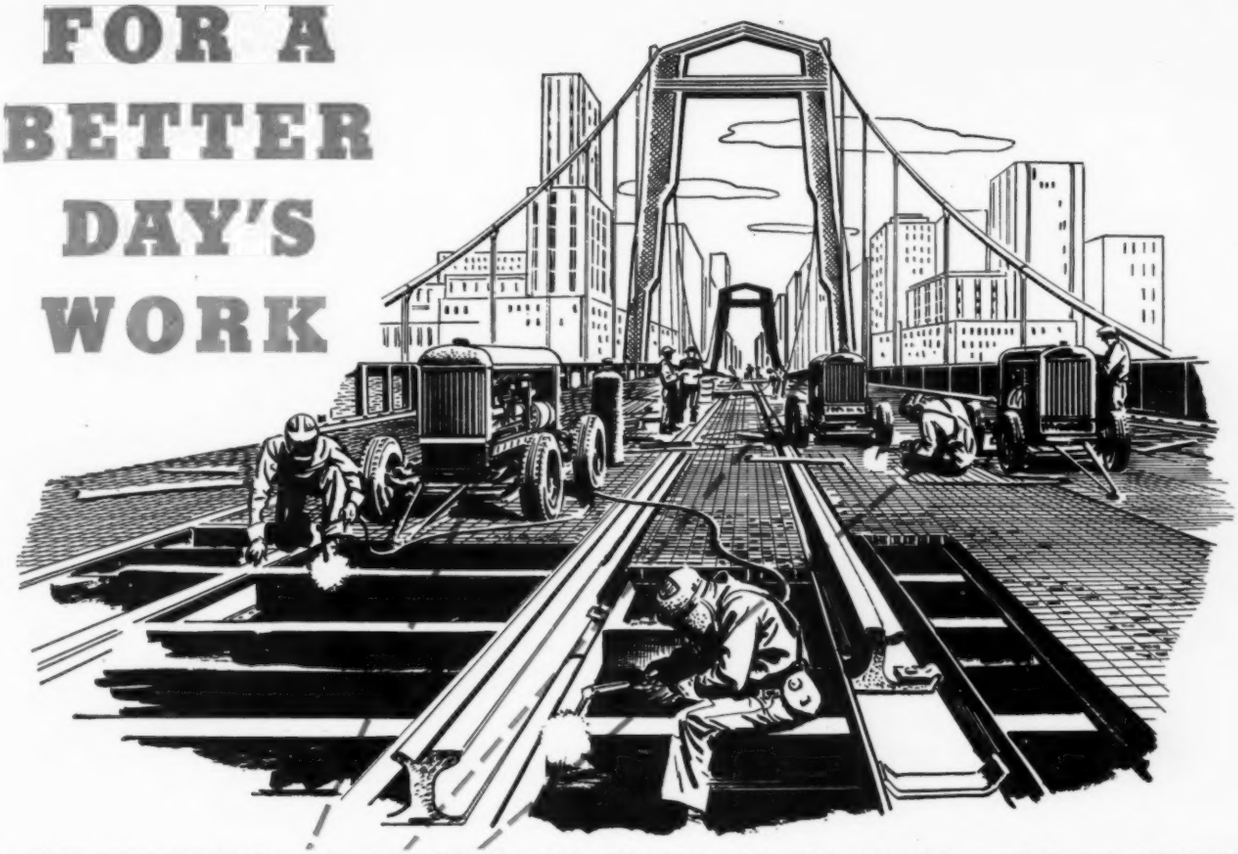


PERFECTION STAKE and DUMP BODIES HYDRAULIC HOISTS

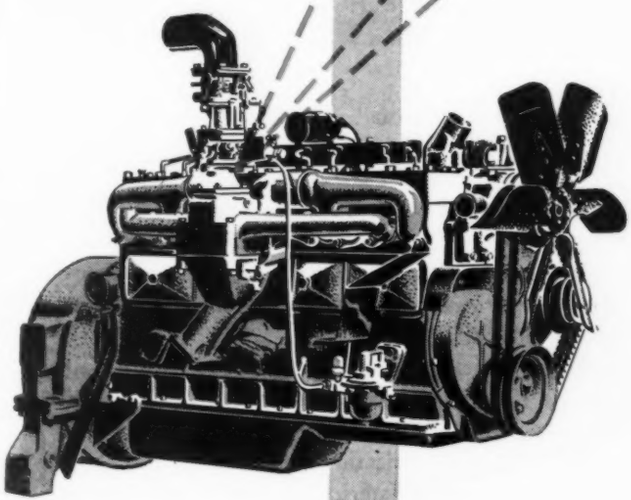
FOR ANY TRUCK STANDARD or SPECIAL UNITS IN ALL SIZES • FOR ANY USE

PATENTS GRANTED AND PENDING

FOR A BETTER DAY'S WORK



ON THE HIGHWAYS — IN INDUSTRY — ON FARMS — IN OIL FIELDS — AND IN FORESTS!



Where metal is arc-welded to metal . . . in bridges, pipelines and other construction projects . . . Chrysler Industrial Power Units provide the most efficient, most economical power. Backed by 24 productive years of Chrysler Corporation engineering and technical skill, each engine and power unit is designed to deliver A Better Day's Work—is built to do the tough jobs in every field where gasoline engines are used. For complete information on the many engine sizes in the line and the wide range of horsepower ratings available, see your local Chrysler Industrial Engine dealer, or write . . .

INDUSTRIAL ENGINE DIVISION, CHRYSLER CORP.
12200 E. JEFFERSON, DETROIT 31, MICHIGAN

NATION-WIDE SERVICE

FACTORY-ENGINEERED AND TESTED PARTS WITH EXPERT MAINTENANCE WHEREVER YOU ARE

CHRYSLER

INDUSTRIAL ENGINES AND POWER UNITS

HORSEPOWER WITH A PEDIGREE

EVEN ON JOBS AS TOUGH AS THESE

Texaco Marfak seals out dirt and moisture . . . reduces maintenance costs. That's why more than 300 million pounds of Marfak have been sold!

BULLDOZE wet, sticky mud . . . churn through desert dust and heat . . . no matter how extreme the conditions, chassis parts get greater protection and last longer when lubricated with *Texaco Marfak*. Maintenance costs are lower!

Texaco Marfak stays in the bearings. It won't work out in rough service or under heavy loads. Ordinary road splash won't wash it out. *Marfak* forms a tough "collar" at the edge of a bearing, sealing itself in and sealing out dirt and dampness. It keeps moisture off metal, protects against rust. And because it's long lasting, fewer applications are needed.

In wheel bearings, *Texaco Marfak Heavy Duty* assures similarly *long-lasting* protection and worthwhile reduction in maintenance costs. *Marfak Heavy Duty* also seals out dirt and moisture, seals itself in, and protects against rust. It won't leak onto brakes . . . requires no seasonal re-packing.

OTHER LUBRICANTS FOR FURTHER PROTECTION

Keep Diesel and heavy-duty gasoline engines clean by lubricating with *Texaco Ursa Oil X★★*. This is a fully detergent and dispersive oil, made to assure trouble-free operation, maximum efficiency, minimum fuel costs.

Protect track rolls from dirt and moisture with *Texaco Track Roll Lubricant*. It seals out contaminants, assures longer bearing life.

Let a Texaco Lubrication Engineer tell you about Texaco's Simplified Lubrication Plan to assure more efficient and economical performance from all your equipment. Just call the nearest of the more than 2300 Texaco Wholesale Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO Lubricants and Fuels

FOR ALL CONTRACTORS' EQUIPMENT

Tune in . . . TEXACO STAR THEATRE every Wednesday night starring Milton Berle. See newspaper for time and station.

ROADS AND STREETS

January, 1949 • Vol. 92 • No. 1

Fast Concreting in Kansas

573,000 square yards of 9-in concrete slab on three projects in one season, with one crew. How the Koss Construction Co. Kansas crew did it, in spite of wet weather and a shortage of rail cars*

By J. B. Beuerlein

General Superintendent, Kansas Division, Koss Construction Co., Des Moines, Ia.

THE Koss Construction Company of Des Moines, Iowa, started their 1948 highway construction program in Kansas on March 1, 1948, at Douglass, Kansas, Butler County. The 1948 program included contracts awarded to the Company by the state highway commission of Kansas for a total of 44.2 miles of 9-in. 22-ft. concrete pavement, including 13.3 miles on U. S. Route No. 77 in Butler County, 8.9 miles on U.S. Route 50N in Rice County, and 22 miles on U. S. Route 81 in Cloud-Ottawa counties.

Butler County Job

The construction of 4-in. granular subbase included in the pavement contracts was started for the 13.3-mile job in Butler County early in March. Equipment on this phase of the work consisted of:

2 Caterpillar No. 12 motor graders
1 Galion Model 102 motor grader
1 D-8 Caterpillar tractor with dozer
1 D-7 Caterpillar tractor with dozer
1 D-7 Caterpillar tractor and pusher
4 DW-10 Caterpillar tractors with LaPlant-Choate CW-10 scrapers
2 Grace sheepsfoot rollers
2 Oliver No. 900 tractors
1 Bros wobble wheel pneumatic roller
1 Seaman pulvi-mixer
2 International K-6 trucks with 1,000 gallon water tanks

Material for granular subbase was obtained from local deposits near the project. Several pits were used as work progressed and it was possible to keep the maximum length of the haul below four miles. The grade was shaped accurately with a No. 12 Caterpillar motor grader and was carefully checked by the engineer before the granular material was dumped.

The four DW-10 tractors and scrapers hauled the granular clay gravel material directly from deposits to the subgrade where it was thoroughly mixed and pulverized by a Seaman pulvi-mixer working each windrow as it was being turned over by a grader. When the material was thoroughly mixed, a sample was taken by the materials engineer of the highway commission and tested for gradation, etc. When approved it was spread, and water added when necessary to provide correct moisture content for compaction. The pulverizer-mixer again played an important role in "wet mixing" the material. The motor grader then spread the material uniformly over the 24-ft. width and a sheepsfoot roller pulled by an Oliver No. 900 tractor did the compacting, with the motor grader working in conjunction to do the shaping and smoothing. The Bros wobble wheel roller made the final pass. The Galion motor grader was busy maintaining haul roads and making minor grade adjustments ahead of the RB finegrader.

Set-up for Paving

While the subbase work was getting under way, the concrete paving equipment was arriving and was being set up at Douglass about four miles north of the south end of the project. The paving equipment consisted of:

2 34-E Koehring twinbatch pavers
1 Northwest Model 8 crane with 2 cu. yd. Blaw-Knox clamshell
1 Manitowoc Speedcrane Model 3000 with 2 cu. yd. Blaw-Knox clamshell
1 Koehring Model 376 crane with 1 cu. yd. Blaw-Knox clamshell

★ Glimpse of the Butler County project. Also worked with paver on either side, one laying the bottom lift and other dropping concrete after placement of reinforcement

*This contractor seems to highball as a general habit—see article "457,000 Sq. Yd. Concrete in a Single Season with a Single Crew," April, 1948, R&S.

★ The finegrader was equipped with a cross-over bridge for batch trucks

1 Jaeger concrete spreader
1 Jaeger "Type X" concrete finisher
1 Jackson twin tube internal vibrator
1 Koehring longitudinal float
1 Flexplane joint installing machine
1 Cleveland form grader
1 Huber tandem roller (8 ton)
1 Buckeye RB finegrader
7,000 lin. ft. 9" x 9" Blaw-Knox forms
2 55-cu. yd. Johnson aggregate batcher bins
1 100 barrel Johnson dutch mill cement plant
1 D-4 Caterpillar tractor and dozer
1 No. 10 Caterpillar road patrol
12 KB-7 International batch trucks
4 KB-6 International water trucks
4 Fruehauf 28-ft. semi-trailer vans for field office, parts department, shop and oil house.

The shops and office were established at Douglass and remained there as headquarters for the entire Butler County project. On April 3, the paving equipment was moved to the south end of the project. The progress of the paving crew was to be northward toward the batching plant. Crushed limestone and Arkansas River sand were stockpiled at Douglass on a lot adjacent to the Santa Fe side tracks where the batch plant was set up for the south half of the project. The batch plant was later moved to Gordon, Kansas, for the north half of the project, to provide a shorter batch haul to the pavers. Forms were then set and the RB finegrader went into action, riding the top of the 9-in. pavement forms. This machine cuts the grade accurately to proper depth. The 8-ton Huber roller followed immediately behind the finegrader to compact any loose material left by the finegrader. After the grade was well rolled, the forms were checked for alignment and a subgrade planer was pulled along the forms to check the grade for high spots.

The two Koehring pavers started on April 6, operating on the shoulder outside of the form line. The mixed concrete dumped on the subgrade was graded off 2½ in.below the top of the forms by the Jaeger concrete spreader. Then the spreader was backed up and the wire mesh reinforcing was placed on the new concrete, and the paver would deposit more mixed concrete on the wire mesh. This was then graded off to the top of the forms by the Jaeger spreader. The Jaeger Type "X" finishing machine followed immediately to shape the roadway crown and to compact the concrete with the internal vibratory bar attached to the finishing machine. The Flexplane machine then installed the plates for dummy groove joints at 20-ft. centers. The Koehring longitudinal float followed immediately doing the final finishing.

The surface was then checked with 10-ft. steel straight edges and a finishing belt was used just before the concrete attained its initial set. Dummy groove plates were then removed and all edges finished with hand edgers. The entire surface of the new pavement was given a light brooming, and covered with Hunt Process membrane curing solution sprayed over the surface.

The pavement thickness on these projects was 9-in. uniform, grade crowned. Blaw-Knox road forms were set in a trench accurately cut by a Cleveland form grader. An International truck with a water tank and spray bar maintained the correct amount of moisture in the granular subbase, and the forms when set and staked were very stable. Stakes were 1" x 24". The settlement of the forms under the heavy finishing equipment was less than one-sixteenth inch. About 7,000 lineal feet of forms were in use on the job.

Streamlined Form Handling

Forms were removed early next day after the pour. Staking pins were first pulled by hydraulic power with a special job-made attachment on the D-4 Caterpillar tractor with a hydraulically operated dozer. Pins were nested in the forms behind the stake pockets for moving. Forms were then loaded on a FWD truck equipped with a winch and small crane to quickly lift the forms and place them on the specially built bolsters on the truck; about fifty 10-ft. forms each load. The small crane on the truck with ⅜-in. cable, was also used to unload the forms. With this equipment, a truck driver and two men would quickly and safely load and unload the heavy forms.

While lowering forms from truck to ground they were easily placed in a neat line convenient for the formsetters. This 3-man crew started loading the forms at 6:00 A.M., and the average day's run of 2,500 road feet (500 forms) would be moved ahead by 2:00 P.M., or in about 8 hours' work. This was possible only after some experimentation in rigging the truck crane with proper guards, hooks, lines, etc., to make this a speedy and safe operation. Forms were rather heavy as each weighed 200-lb. per section. In paving the 44 miles during 1948 it was necessary to load, transport, unload and reset 464,640 lineal feet of forms. This job was completed without a single lost-time accident in connection with handling the forms. In setting forms all staking pins were driven with a Model 80 Boyer rivet hammer with compressed air furnished by a Schramm air compressor mounted on a Willys jeep.

Flintseal sealing compound was used to seal the joints immediately after the curing period. This material was melted in a new Sealz Melter kettle.

Dummy groove joints ⅜" x 2½" were spaced at 20-ft. intervals. Before pouring the sealing compound, the grooves were thoroughly brushed

★ Concrete paving "procession," as seen on the Cloud County project. Paver on each side, finisher and spreader working right behind

with a wire brush to remove the curing compound and anything that may interfere with perfect bonding and sealing of the joints. Just ahead of pouring, a special air nozzle was used to blow any loose material from the groove. Air was furnished by a Model 105 Jaeger compressor, pulled along the shoulder.

How Equipment Moved

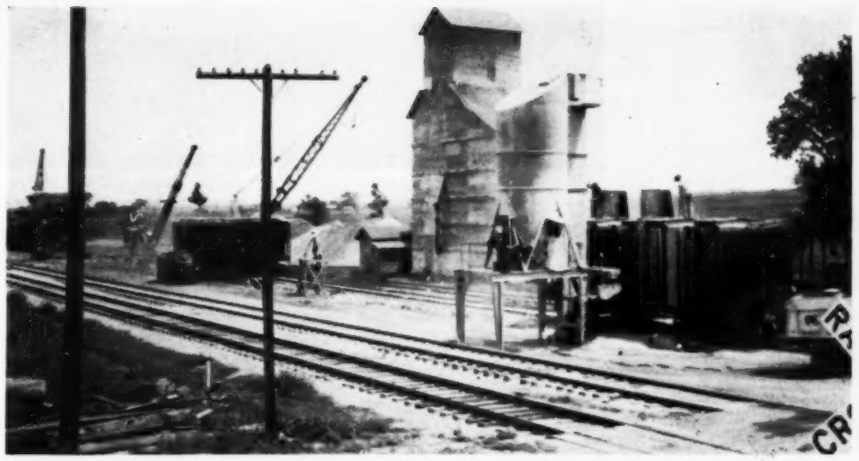
Moving the paving equipment to the different locations on these projects was accomplished with an Armstrong low-boy 20-ton trailer pulled by an FWD truck. Two sets of 20-ft. steel ramps were made on the job for this purpose. Each consisted of four old discarded road forms. Two were welded end to end. The other two were also welded end to end, then turned and placed face to face with a one inch steel spacer welded between the two faces. This type of ramp required only blocking at the truck to raise it to proper height. The spreaders and finishing machines would travel under their own power from the forms up these ramps, with wheel flanges in the groove made by the one inch spacer blocks. This method proved safe as well as speedy.

Progress of the pavers and subbase crew was such that neither crew was disturbed by the maneuvers of the other. The 13.3 miles of paving in Butler County was completed on May 27 in less than eight calendar weeks, including the moving of the batch plant from Douglass to Gordon for the north half of the project.

One of the cranes with a clamshell was sent to Rice County to unload and stockpile concrete aggregate two weeks before paving was finished in Butler County. Since Rice County was next on the schedule, and that project did not require granular subbase, the subbase crew and all subbase equipment were assigned the job of building the shoulders along the new pavement in Butler County.

Paving started in Rice County on June 9, with exactly the same line-up of equipment and key personnel as was used in Butler County. June and July were very wet months in Kansas, and paving was delayed considerably. Both pavers were operated on the 8.9-mile Rice County project when weather permitted, and average production on this project was about 230 ft. per hour. The Rice County project paving was completed July 26.

The crew remaining in Butler County to finish the shoulders made excellent progress, and the men were moved to Cloud-Ottawa counties to start the granular subbase (22 miles) there early in July. The construction methods and equipment used on the granular subbase in Cloud-Ottawa counties were substantially the same as were used at the beginning of the season in Butler County. Material was obtained from selected deposits near the project. Lack of rainfall and very dry material required the use of more trucks equipped for water hauling. This work was well advanced and out of the way when the pavers started there on August 4.



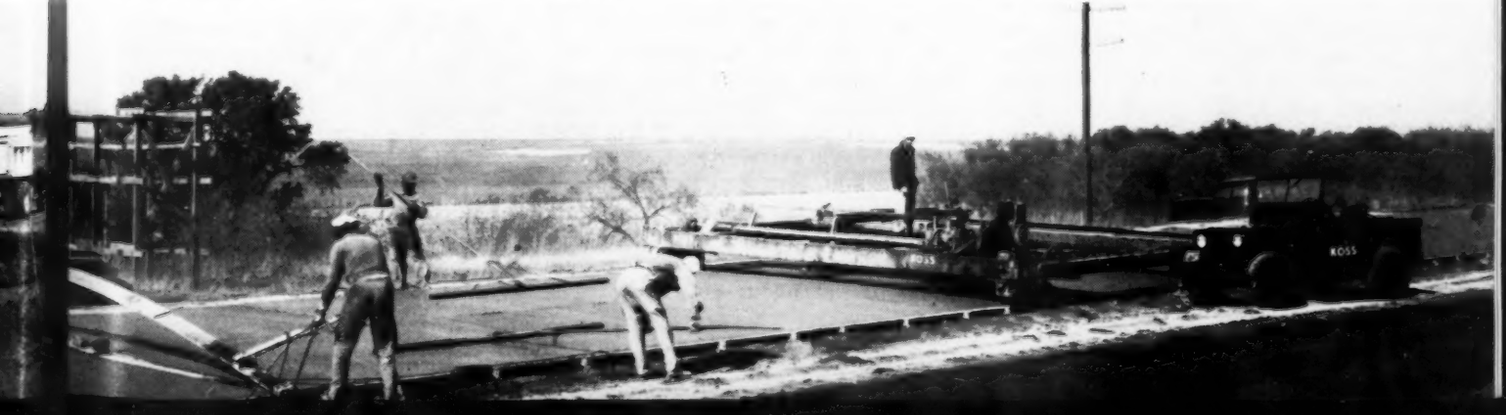
★ One of the season's six batching plant locations (tall building is a grain elevator)

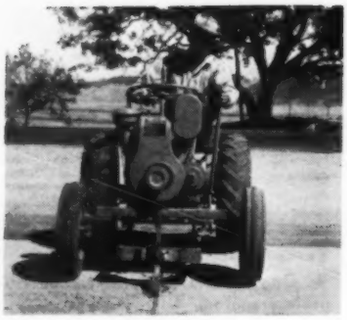
★ The type X finisher gave a good account of itself on the Koss jobs

Planning Brings Results

In planning the work in the field, the entire year's program was considered as one project. Men and

★ Longitudinal fleet finisher and surface checking operation. Koss, like many a contractor, makes good use of the Jeep





★ (Left Above): 28-hp. tractor with scarifier tooth and rooter, hydraulically operated. (Right Above): Latest machine used, with catcher for material

★ (Lower Views): Small tractor with scarifier tooth, another successful type of unit for this work

equipment were moved back and forth as conditions changed and problems developed.

Obtaining concrete aggregates in sufficient quantities was the chief problem of the year. This was caused by a shortage of railroad equipment rather than a scarcity of material or failure of the producers. An effort was made to ease this condition by using an advance crane and clamshell to stockpile material at the different locations well in advance of the arrival of the pavers. This proved to be a help but was not sufficient to entirely fill the gap. The same line-up of equipment, incidentally, was used throughout the 44-mile march.

The non-productive time required to move from job to job has been reduced considerably by the Company's eye for mobility which supplies zest for this unpleasant job. It has often been said that moving the outfit is the hardest part of construction work. That saying will be disproved as we get more and more mobile.

Pavers operated a maximum of 10 hours per day, but there were many short days caused by the lack of aggregate. Progress was best in Cloud-Ottawa counties, where the best single day's run of the season was reached, 2,800 ft. of 22-ft. pavement in one 10-hr. run. In a period of four consecutive days, a full two miles was paved. The 22 miles in Cloud-Ottwa Counties were paved in 12 calendar weeks, which included two moves of the batch plant and all equipment, and included about ten days of waiting on materials. The last batch was poured on October 28, to complete more than 573,000 sq. yd. of concrete pavement for the crew in Kansas during 1948.

The work was performed for the state highway commission of Kansas, R. C. Keeling, chief engineer, and H. O. Reed, construction engineer. The Butler and Rice county projects were under the direction of Lyle Munn, division engineer, Hutchinson, with J. A. Doubrava resident engineer on the Butler County project and Frank Drake resident engineer on the Rice County project.

The Cloud-Ottawa counties project was under the direction of George Horning, division engineer, Salina, with Don Christensen resident engineer on Cloud County work and V. L. Carter resident engineer on Ottawa County work.

New Power Joint Cleaning Machines Developed in California

MAINTENANCE engineers in California have long been out in front in their search for a mechanical method of speeding up joint sealing and cleaning on concrete pavements.

Latest equipment of this kind, according to word from T. H. Dennis, state maintenance engineer at Sacramento, is a small pusher-type device, see accompanying photographs. Four of these machines, which are still in the experimental classification, have been built by the men in the division of highways' maintenance shops. These are powered by a 3 h.p. Wisconsin motor and weigh about 250 lb. each. Six carboloid steel inserts mounted on the circumference of a 7-in.-diameter steel disc make up the cutting points. The cutter revolves clockwise at about 800 r.p.m. The machine is mounted on rubber tires, is easy to push and is quite mobile. The hopper or catcher attached to the end of a metal chute to pick up the old joint material cuttings has not worked too well of late according to Mr. Dennis, whose staff is still experimenting with this pick-up.

When not using the pick-up, the operator can extend the exhaust pipe from the engine down into the joint just behind the cutting teeth, then proceed to blow out the old material, in a fairly satisfactory manner.

The performance of the machine has been satisfactory as long as the cutting teeth are sharp, it is explained, but teeth require sharpening about every three hours. It is reported that better methods are obtained in the morning when the old joint material is hard and brittle than later in the day when the material becomes slightly softer. Cutters of ¾-in. size have been used, which give from ½-in. to ¾-in. depth of cutting. The operator is able to clean 1200 lineal ft. of joints per hour when the cutter is sharp, and usually averages from 6,000 to 7,000 ft. per day.

The California division of highways has recently let two joint sealing projects to contract. The contractor's procedure is to clean the old material from the transverse joints by the use of a steel tooth or rooter, hydraulically-operated, mounted between the front wheels of a small 6 h.p. Lincoln tractor. The tractor is very mobile, has operated many days without a breakdown, and does a satisfactory job. This machine is also pictured here, as is an Oliver Industrial tractor of 28 h.p., which the conractor has been using to clean longitudinal joints. This larger machine operates in the same general manner as the Lincoln tractor, but is faster and has considerably more power.

Power equipment for cleaning out concrete pavement joints is now available commercially. ROADS AND STREETS will be glad to pass reader's inquiries along to the manufacturers.

More Highway Coal Hauling

More than 50% of the nation's coal now is hauled some part of the way to market over highways, according to figures from J. T. Calloway, president, American Road Builders' Association. Trucking of bituminous coal increased 46% from 1939 to 1946, the estimated tonnage for the latter year being 16,000,000. These figures do not include secondary hauling from retail yards to consumers.

Patch By Patch Commentary

By Ben H. Petty

Professor of Highway Engineering
Purdue University, Lafayette, Indiana

"OH! it is just a simple road patching job—anyone can do it!" So say most of the general public and, unfortunately, too many responsible road engineers and officials. As a result, we motorists bounce along over high patches, fat and corrugated patches, ravelling patches, and unpatched holes.

Any *real* road maintenance man knows full well that correct road patching is an art acquired only through patient and persistent study, experiment and bitter experience. When once you have developed an honest-to-God road patcher, hold on to him, even though you have to pay him a salary that makes a Project Engineer envious. It's one of the best investments a highway department can make.

If you don't believe it, just play the part of a *keen* observer the next time you make a lengthy trip over county or state highways that were messed up a bit by the last spring break-up. You'll be surprised! I notice that when I am riding with some of you, you try desperately to miss hitting those bumpy patches, or, when we come to a place where they are as thick as freckles, you try to center my attention on a bit of interesting scenery off to one side of the road. Clever chaps, these highway men!

Here are a few suggestions from a sideline quarterback:

1. **Edge Ravellers.** When patching a shallow depression where no surface cut is to be made, try spreading your paint or tack coat an inch or two beyond the limits of the proposed patch. And use fine enough aggregate so that you can get a fairly thin featheredge.

2. **Fat Softies.** Always remember that you can *add* bituminous material to aggregate, but you can't *subtract* an excess after it once is in the patch! How many men in your patching crews possess sufficiently keen judgment to estimate the exact amount of bituminous material to pour in a hole in proportion to the aggregate used? The general idea seems to be that "if a little is *good* then more is *better*." Result—fat, soft, and shovey patches. Pre-mixing batches for patching should eliminate such defects if proper quality and quantity of materials are used. Excess bituminous material *may* drain out in the stockpile

A little extra work in carefully cutting a vertical edge around the patch hole usually pays good dividends in properly confining the patch material.

3. **High-Low Nuisances.** As Paul Harvey, the radio commentator, would say it, the proper thickness of the patch to allow for final traffic compaction "is a case of good judgment!" We acquire judgment by experience. And when once acquired, it is a pity to chuck it and start all over again because of a political upheaval. If the patch is too high, the final result probably will be two additional holes, one fore and one aft of the patch. If it is too low—well, we can always add a thin layer. But, wouldn't it be nicer if we got them right the first time?

4. **No Patch at All.** Now I'm burning! I suppose there are extenuating circumstances occasionally that might justify the existence of an unpatched hole in a pavement for a week or so. But when such surface breaks are permitted to widen and deepen under traffic pounding for a period of months, then I think it is high time for the boss-man to get out that bottle of turpentine and start applying it where it will get action *now*.

Several months ago I was driving to the Indiana City of "X" on a heavily-traveled concrete pavement. I was rolling along at about 45 miles an hour, minding my own business, when WHAM! I hit a six-inch-wide break at a transverse joint. Fortunately, no tires blew out, but the jar was terrific. For a few minutes I had the terrifying impression that from that time on I would be the unfortunate possessor of a pair of floating kidneys. Then I remembered that I had hit that same break on a similar trip about a month previous. I should have been on the look-out for it, but I guess my confidence in these maintenance men is too well established.

Seriously, fellows, there can't be many things on your list of chores more important than keeping the road surface smooth and safe for traffic.

5. **Back to Those Fatties.** In my opinion, a good bituminous road-mix or bituminous concrete surface, after a few months of traffic, should not be black, but should take on the color of the aggregate used. If it continues a coal black color, it *probably* contains too much bitumen which sooner or later may develop corrugations.

Naturally, that goes for patches, too. Fat patches disclose your hand to the traveling public. Their coal-black color makes them stick out like a sore thumb in the surrounding, lighter colored road surface, thus giving the motorist the idea that you must be a poor road man if your surfaces need so many patches.

Cut down on the quantity of bitumen and the patches will so blend with the rest of the surface (if similar aggregate is used) that they will not be readily discernible. If you use too little bitumen and raveling starts, you can always seal these patches.

Leaner patch mixes always are desirable where you plan to re-seal or surface treat that section of road the same season. A fat patch will bleed right up through the new seal or surface treatment and all the old patched areas become readily discernible to the traveling public. Thus, after a few months of traffic, your nice, new surface looks worse than the late "Messy Bessy" of comic strip fame. It's bad for you—don't you think?

As published in "Highway Extension News" of the Purdue School of Engineering.

Safety Ideas

Painted Curbs at Danger Points

Ohio traffic engineers and maintenance men cooperate on numerous tricks that aid traffic flow and reduce accidents. One is the practice of yellow-painting curbs and barriers at restrictions such as the underpass shown here. Handy paint spray cart and spray gun help speed this work.

EDITORIAL

★ Secondary Highways by Contract? Why Not

A trend which should cause everyone in road building to stop and think is the trend toward more road construction by force account. Much credit is due Burton Miller of the American Road Builders' Association headquarters staff for giving publicity to this serious development.

Speaking in ARBA's "News," Mr. Miller points out that while federal-aid highway work done by force accounts amounts to only about $5 million a year, or a fraction of one per cent of the total federal-aid program, the picture is entirely different on state, county and city road and street work where federal-aid does not enter into the financing. Recent PRA figures for the past year show that state highway departments completed 2,776 force account construction projects totaling $46,500,000. This total does not include secondary federal-aid projects or county jobs. Total force account work undertaken by the states and reported by PRA for 1947 jumped to $51,694,000, or an increase of 60% over the previous year. Even these high figures do not take into consideration the vast but unmeasured amount of work carried on by counties and cities which is not reported.

Still another element of the picture, according to Mr. Miller, is the practice of hiding road improvements under the classification of maintenance. Many thousands of miles of hot-mix resurface, for example, have been placed by various state highway departments without benefit of contract.

While highway maintenance, like postal service, is a type of continuing work that lends itself to performance by career people in public service; not so with construction. It is against American principle for a state, county or city organization to go into the new-construction business in competition with the private enterpriser. Most of the time we venture that it is not the most efficient or economical way to get a mile of road work done. The organizations involved almost never come clean as to the true costs of the work. When they try to do so their costs are not easily judged, since the various organizations do not have a standardized or unified cost accounting system permitting comparison and evaluation of each other's work between themselves and compared with the results of contractors' efforts.

Many are the excuses or attempts at justification given by the public bodies in doing important work which might be awarded to contract. Most common justification lately is that contractors are scarce and their prices are high or their bidding interest indifferent. Such a condition is partly the result of a state of mind of not wishing to do business with contractors. There are many things which a county can do to interest contractors in its program. For example, two or more counties can get together on a series of jobs, which might be offered as a single parcel, sufficiently large to attract contractors, if largeness is a factor (it isn't always). Counties can encourage contractors by setting up a year-to-year program which will insure continuing work for contractors large and small.

It is true that city, county and state departments must maintain a year-around organization to perform essential maintenance. But a bureaucracy, like an old-fashioned corset ('twas said), tends to creep up. The whole matter is a subject for clear and honest thinking, and a constant remembering that the first duty of the highway organization is toward the public and its first yardstick is economy. There is nothing like competition between businessmen—in this instance contractors—to insure economy in road construction and heavy repairs.

★ What Makes a Contractor Tick?

In this issue is an article which describes a remarkable year's run of concrete paving by one contractor crew. The article, while extremely interesting as a straightforward presentation of what was done, and with what equipment, leaves largely unsaid the most important element in the story. This element is "how."

To be sure, some "how" information is included here and there; for example, the author goes into some detail on the mechanized methods of handling road forms.

But such details merely skirted the real subject, which is management. Why is it that one contractor can do better than another when he comes to mobilize an outfit of men and machines, get equipment moved, get materials lined up to arrive on time, see ahead to meet and offset emergencies, dovetail and interlock the complicated tasks of each project, and in turn integrate three widely scattered projects into a single operation? One contractor can do it fast, another can do it less speedily, a third will bog down. The secret, of course, lies with management ability, which boils down to the ability to plan, and to select superintendents and foremen and give them responsibility, and to hire and teach and keep good men of many skills, and to instill in these men team spirit and loyalty and a feeling that they are sharing in the enterprise.

All of these undiscussed elements of management, we understand, are practiced to a high degree by this contractor. Among other clues is that he is known to be "a good guy to work for," in that he takes care of his men when they or their families are laid up, and sees that the best of them are given a reasonably steady outlook of employment.

Of course, he also utilizes modern machines and tools to the limit, and begins each year with a thoroughly overhauled outfit. Close day-by-day control of costs and progress, through traveling field offices complete with an office gal for each unit, make up another part of the picture for this organization, which is run by a gentleman named Koss, well known in contractor organization work.

What is running through our minds is that it's too bad contractors can't

get together and discuss job problems and procedures, like engineers do. We have just attended the Highway Research Board annual meeting, where 70 or 80 technical papers were presented, and where the scientists sat around doodling on luncheon tablecloths, and chewing over their mutual problems and swapping their wisdom and experience. It would pay contractors and their superintendents, foremen and engineers to do more of the same, getting down from the rarefied levels of such broad industry problems as legislation, taxation, labor union matters, etc., to discussion of such practical "brass-tack" matters as man-hours, equipment hours, and unit costs of doing this or that. Or is all this still reserved for Utopia?

★ Homely Facts—Not Oratory

"Why do we need highways?" was the title of Bernard Gray's talk at the dinner following the one-day session of the Asphalt Institute regional meeting in Oklahoma City on Nov. 23. I would say the title of Mr. Gray's talk would be "Transportation and the American Way of Life." Mr. Gray is chief engineer of the Asphalt Institute.

I have listened to dozens of after-dinner, before-dinner, and other-time talks, but this message was the essence of simplicity, modestly delivered and packed with the reflections of seasoned experience. It was a fine discussion of the American Way of Life as related to the development of transportation.

Mr. Gray developed the theme that the vehicle, not the traveled way, was the important element in the progress made in transportation. In our narrow thinking we might begin to believe that the road, or the railroad, or some other supporting system, was the major contributing factor to our modern standard of living. As a matter of fact, pointed out Mr. Gray, the vehicle is the factor responsible. And, he said, it is entirely possible that before long we may lose over-the-road freight hauling to the railroads. Who are we, he stated, with our infinitesimal minds as compared to the creations of the universe, to say that "it can't be done?" How right he is.

Throughout this splendid address Mr. Gray drew upon his recollections and upon the storehouse of general knowledge he has tucked away in one corner of his brain, to correlate private enterprise, competition, and materials of construction as well as types of transportation. I recommend him to you for your next meeting.

—V. J. Brown, Consulting Editor.

★ Forty Bucks No Longer Buys an Overcoat

This fact could be used with good effect by any number of county highway engineers of our acquaintance in going before their board members, as an illustration of the fact that present inflated prices simply must be seen through 1949 spectacles. It takes more like eighty dollars than forty to buy a good overcoat. And it takes ten thousand dollars, sometimes, to buy new equipment that before the war cost only half that much. A county engineer or board member who balks at a high purchase price for a needed piece of maintenance machinery would do better to look at the saving or earning power of the machine in question. With the present high wages, scarcity and easy-going tendencies of the laboring man, a dollar invested in better equipment will pay big dividends.

The most expensive road you have is the one that's going to pieces for lack of proper repair. The most expensive machine you have is your old, worn-out machine that doesn't do its share of the work. This winter is a fine time to sit by the stove and do some real "figgerin'."

★ Divided Roadway Cuts Accidents by 52%

Engineers as well as the traveling public would readily agree that a divided highway with access partially limited is much safer than an old fashioned 3-lane highway not divided. But actual comparative data of this kind are not as widely available as we would like to see.

Hence many will read with keen interest the data presented recently by B. A. Switzer, associate highway engineer, California division of highways in "California Highways and Public Works." As related by Mr. Switzer, California long maintained a three-lane highway between Colton and Ontario, as part of U.S. 99 and 70. The heavy mixed passenger and truck traffic had frequent accidents, and in view of its traffic and accident record, the State propsed the improvement of this highway.

With the close of the war, the post-war construction program was started. The road was constructed as a limited freeway, but right-of-way for grade separations was obtained so that the road could ultimately be constructed to a full freeway by stage construction.

In Table I is presented a comparison between the accident record of the new freeway from its opening to traffic, to March 30, 1948, and for a similar period of time on the old highway before the freeway was in use.

Considering the total length from the east city limit of Ontario to the west city limit of Colton, the accidents were reduced from 154% on the Old Valley Boulevard to 75 on the freeway, which represents a decrease of 52%. Fatal accidents were reduced 60%. Accidents involving pedestrians have been entirely eliminated.

Some 28% of the accidents on the total length between Ontario and Colton occurred on the two short temporary connections. If the record of the temporary connections is eliminated, there is a reduction in accidents on the freeway amounting to 64%.

Comparisons made on 15.2 miles of freeway, exclusive of the temporary connections and a similar mileage on the old road, show that the daylight accidents have decreased to a greater extent than night accidents. Collisions in daylight, involving two or more vehicles, have been decreased by 83% compared with 48% decrease at night. Daylight accidents involving property damage only have decreased by 78%.

DOES PUSHLOADING Pay Off?

★ Pushing loading gets capacity loads in minimum time, keeps tractor power working and producing results at top efficiency

Yes, it does, says this author, and extra pushing power pays better. Every job should be analyzed

By D. K. Heiple
Chief Field Engineer
R. G. LeTourneau, Inc., Peoria, Ill.

GENERALLY speaking, one of the best methods developed by contractors to increase scraper production and lower costs has been the practice of push or snatch loading. The earlier use of double-bucket scrapers and tandem operation, although still highly regarded in some sections of the country, has not found nearly the field acceptance accorded the big scraper and its pusher tractor.

In theory, the principle of helper loading, either pushing or pulling, is a simple one. Loading time, averaging one minute, is ordinarily no more than one-fourth of the total hauling cycle and very often is less. Since loading ordinarily requires more power than hauling, a unit capable of loading a given size scraper often has this difference in power idle during the largest part of the earthmoving cycle—idle when it could and should be working. The obvious solution is to relate size of load to hauling power and supply some other means of obtaining this load. Job planning for down-hill loading is perhaps the simplest and most economical method when it can be practiced. Tandem operation and double-bucket scrapers are a partial solution since they allow loading in two stages, reducing the resistance and thus getting larger loads with the same power.

Utilizes Entire Power

However, a pusher tractor working in a fleet of scraper units can utilize the entire tractive power of all machines both in loading and hauling in much the same manner as a balanced truck and shovel operation. The high speed, rubber-tired prime mover and scraper unit is operated on this principle. The design and speed of this type equipment are such that they do not lend themselves readily to independent loading, and the economy of a pusher is a more or less accepted fact. *The difference, however, between sufficient and insufficient pushing power is not so readily recognized.*

Let's consider a few of the possibilities with the pushloading method. Assume a tough clay subsoil in which a 15-cu.-yd. tractor-scraper combination can load 8 pay yards of earth. Two such tractors, one pushing and one pulling a 23-cu.-yd. scraper, should load 15 pay yards. On a haul allowing 12 trips per hour, the 15-yd. unit will haul 96 cu. yd. per hour and the 23-yd. unit, 180 cu. yd. per hour. Production is up, but so, of course, are equipment costs. For comparative purposes, all ownership and operating costs of typical machines, neglect-

★ Fast rubber-tired scrapers and prime movers make push loading pay. Fleet operation is designed to keep both loading and hauling power busy

ing any provision for supervision, overhead, or contingencies are:

	15 Cubic Yard Tractor-Scraper	23 Cubic Yard Tractor-Scraper
Hourly Ownership & Operation	$8.00	$10.00
One pusher can serve three scraper units; therefore, add ⅓ an hourly cost of $6.50 to the larger unit.		2.16
Total hourly cost	$8.00	$12.16
Yards per hour	96	180
and Cost per yard becomes	8.3 cents	6.7 cents

Increasing the length of haul will reduce costs of the larger unit, as pusher costs may then be prorated over the increased number of scrapers one pusher can load.

Conversely, the easier loading becomes, the smaller the cost differential that will result since loading and hauling power requirements will more closely approximate the same figure.

Figuring Another Way

Under the conditions named, however, it may even pay to push the smaller unit rather than to use self-loading. In our example, 8 pay yards could be loaded independently. Addition of the same size pusher should easily result in capacity loads of 10.5 pay yards.

Then:

	15 Cubic Yard Scraper Self Loaded	15 Cubic Yard Scraper Pusher Loaded
Pay yards per load	8	10.5
Trips per hour	12	12
Pay yards per hour	96	126
Hourly Ownership & Operating Cost	$8.00	$ 8.00
⅓ pusher cost of $6.50		2.16
Total Hourly Cost	$8.00	$10.16
Cost Per Yard	8.3 cents	8.1 cents

It is also possible that with the power available, faster loads could be obtained, resulting in one more trip per hour. Production then becomes 136 pay yards per hour and cost per yard is 7.5 cents. From the opposite approach, a smaller pusher might have been used to obtain a maximum load in the same time but with somewhat smaller hourly cost. Then, assuming one dollar less per hour for the pusher would result in unit costs of approximately 7.9 cents per cu. yd.

From the standpoint of the rubber-tired prime mover, the value of the pusher is almost without question. However, the value of sufficient power is not so readily apparent. Within reasonable limits, it is difficult to visualize the situation in which too much power exists, since, at the point where bigger loads are impossible, faster loads will almost certainly result.

Seldom Too Much Power

For instance, with a fast cycle, a fleet of rubber-tired units making 30 trips an hour would increase production by 15 cu. yd. if a larger pusher can load as little as 0.5 cu. yd. additional. One dollar increase in the hourly ownership and operating costs of the larger pusher tractor over the smaller makes this dirt cost 6.7 cents per cu. yd. On the other hand, if the load cannot be increased but 12 seconds can be cut from the load time, the resulting accumulated time amounts to $12 \times 30 = 360 \div 60 =$ 6 minutes. Six minutes at the rate of production on this job is three additional trips. With a nine cubic yard pay load, the increased dirt hauled is 27 cu. yd. In this case, if the larger pusher costs $1.50 more each hour, the extra dirt costs about 5.6 cents.

It is altogether improbable that these figures actually represent any given job. They are, however, indicative percentage-wise of the relation pusher costs bear to hauling equipment expense. The additional saving that results from spreading supervision and overhead charges over a higher production rate might also be considered by the contractor. These items will almost certainly fail to increase in a direct ratio to the quantity of work accomplished.

The general conclusion, then, is that pushloading does pay. Fleet operation is a necessary condition, of course, but on most jobs, a pusher should pay for itself and on many will add materially to the profits.

Pushing power pays. Extra pushing power pays better. Analyze the possibilities on your job.

Know the Strength of Hemp Rope? Cotton Rope? Steel Cable?

By W. F. Schaphorst, M.E.
Newark, N.J.

This writer finds that most users of rope and steel cable don't know the relationship between the size of the rope and its strength. They know that a large rope is stronger than a small rope, and that's about all. It is therefore believed that the following rules will be welcomed:

For cotton or hemp rope, square the diameter of the rope in inches and multiply the product by 200. Thus for a ½" rope we have ½ x ½ x 200 or 50 lb., which is the safe strength.

For steel cable square the diameter of the cable in inches and multiply by 12,000. Thus for a ½" cable we have ½ x ½ x 12,000 or 3,000 lb., which is the safe strength. Do not apply this latter rule to iron rope. Iron rope is not as strong as steel rope.

●

Securing Draftsmen from High Schools. Fifteen recent high school graduates are now at work in the drafting division of the Oklahoma state highway department after completing a special 8-week course at the Oklahoma A. & M. College.

★ Double-bucket type scrapers load in two stages, are still highly regarded in some sections of the country for better utilization of tractor power

★ Tandem operation—once popular, but now seldom seen—helps get big loads but is considered to be a time consuming, cumbersome way alongside modern pusher methods

Highway Research Board

Nearly a thousand delegates attended varied 4-day meeting, held Dec. 7-10 at Washington, D.C. Over 100 papers and committee reports given

ANOTHER Highway Research Board annual meeting, the 28th, has been concluded. It was confused by the multiplicity of meetings and the long daily sessions. Many excellent papers were presented, outstanding of which in this reporter's opinion were the paper on "Factors Underlying the Rational Design of Pavements," by F. N. Hveem, and the symposium on "Investigations of the Design and Control of Asphalt Paving Mixtures and Their Role in the Structural Design of Flexible Pavements." The latter was a report on the work of the Corps of Engineers, Department of the Army, U.S.A., that was conducted at the Corps of Engineers Flexible Pavement Laboratory located at the U.S. Waterways Experiment Station, Vicksburg, Mississippi.

Vicksburg Design Work

In preliminary work it soon became apparent to the engineers, charged with the responsibility for design and construction of military airfields and roads, that it would be necessary (1) to select a simple testing device suitable for design and field control of asphalt pavements; (2) to correlate the results obtained by the use of the selected device with field performance for various wheel loads; (3) to establish suitable criteria for asphalt pavements; and (4) to establish the thicknesses of asphalt pavements of known quality for various wheel loads.

For the first objective it was particularly desirable that the selected testing machine or device could be readily adapted to the existing California Bearing Ratio testing equipment. Of the several types of devices or machines investigated, the Marshall machine was selected. Final selection was based on the ability of the machine to satisfactorily measure properties of a paving mixture when compared to an existing machine known to be suitable for the purpose. The comparative device was the Hubbard-Field machine. The Marshall machine is being used to measure the stability and flow of the paving mixtures; also, the values it gives can be used for selecting proper asphalt content, and can reflect variations in gradation of aggregate, character of aggregate, variations in filler content, and penetration of asphalt.

Using data obtained from the laboratory study and from the accelerated traffic tests, the following criteria were established for asphaltic concrete surface course pavements for wheel loads between 15,000 lb. and 37,000 lb. on single wheels, and 60,000 lb. on dual wheels with gross tire pressures between 55 and 100 lb. per sq. in. and net pressures as high as 140 lb. per sq. in.

Stability, minimum	500 lb.
Flow, Maximum	20
Percent voids, total mix	3 to 5
Percent voids, filled with asphalt	75 to 85

Pavement thicknesses conforming with the above criteria and considered suitable for wheel loads used in traffic testing, when placed on base courses of 80 CBR values or better, are as follows:

Wheel Loads Pounds	Total Pavement Thickness—Inches	Binder Course Thickness—Inches	Surface Course Thickness—Inches
15,000	2	—	2
37,000	3	1½	1½
60,000 (dual wheels)	3	1½	1½

Flow is the only property used in the criteria established which has not been generally used in connection with evaluation of asphaltic mixtures. It may be generally defined as the plasticity of the compressed mixture.

This symposium consisted of the following papers:

Introduction, Gayle McFadden and Walter C. Ricketts; "Selection of Test Equipment," John M. Griffith; "Laboratory Study of Asphalt Paving Mixtures," W. K. Boyd; "Asphalt Stability Test Section," C. R. Foster; "Correlations of Laboratory and Field Data," W. G. Shockley; "Detailed Test Procedures for Design and Field Control of Asphalt Paving Mixtures," John M. Griffith; "The Practical Application of the Design Method of Asphaltic Mixtures to Pavement Construction," W. K. Boyd; "Design of Asphalt Mixes as Related to Other Features of Flexible Pavement Design," W. J. Turnbull.

In summation, it is considered by the Corps of Engineers that the procedures and criteria proposed will permit the engineer to design asphalt pavements with confidence. These procedures and criteria, together with the CBR method of thickness design and the compaction requirements constitute the report on this phase of the whole field to be investigated.

Discussion indicated that since this was an entirely empirical method, it is desirable to continue investigation into fundamentals in order to obtain rational design procedure. Portability of the Marshall machine was a large factor in the development of the procedure presented.

California Design Work

In contrast to the Corps of Engineers method, in another session a paper entitled, "The Factors Underlying the Rational Design of Pavements" was presented by F. N. Hveem, Staff Materials and Research Engineer, Calif. Division of Highways, and R. M. Carmany, Associate Physical Testing Engineer of the same Division. The Corps of Engineers procedure employs the California Bearing Ratio method of testing while the method presented by Mr. Hveem describes other methods of tests. This method first analyzes the problem of how to provide a type and minimum thickness

Charles H. Scholer

of base and pavement which will resist all failures caused by wheel loads. In this analysis the three main questions were (a) how to anticipate the state of moisture density equilibrium which will develop in the soil during the service life of the project, (b) how to prevent failure due plastic deformation of the soil substructure, and (c) how to prevent failure due to cracking of base and surface caused by flexing of foundation (fatigue failures). These questions were broken down into their respective major factors, contributory factors, principal variables, and other variables. Then the authors indicated those items in the breakdown for which test data were needed to obtain values, those items for which values could be calculated, and items for which values had to be assumed.

Values from stabilometer tests and from other data were taken from a specially prepared chart on the relationships between resistance value of the soil, traffic load equivalent, thickness of base and surface required for minimum tensile strength material, cohesiometer values of surface types, and combined thickness of base and surface corrected for tensile strength. Then two intersecting curves may be drawn, which point of intersection will determine the most economical design thickness that will keep the subgrade soil from expanding and absorbing additional moisture and will also protect the subgrade from failure under traffic due to plastic flow.

Strain Characteristics Needed

Under the heading of "General Engineering Approach to the Classification and Identification of Soils," Jacob Feld, Consulting Engineer, New York City, stated that the classification of soils should be along the lines of strain characteristics rather than those of stress; namely, elastic strain, plasticity, and fluidity, for the phenomena are evident and measurable, and embrace within them the results of all the stresses which may act. He stated that a study of all of the proposed classification systems in the past 25 years, as reported in the voluminous literature on this phase of soil mechanics, indicates that none permit certain identification of the soil properties for application to general engineering problems. He agreed that

1948 Bartlett Award to G. Donald Kennedy

G. Donald Kennedy, vice president of the Automotive Safety Foundation, received the annual George S. Bartlett award for outstanding service to highway transportation progress.

The presentation was made at the annual meeting of the Highway Research Board by F. V. Reagel, Chairman. Mr. Kennedy was introduced by PRA Commissioner Thomas H. MacDonald, who was the first recipient of the honor in 1931.

Mr. Kennedy, who lives in the District of Columbia, formerly was Michigan state highway commissioner, and served in 1941 as President of AASHO. During the war he was chairman of ASCE's committee on postwar construction. In 1941 he was named by President Roosevelt to the national committee on interregional highways, serving as vice-chairman of that committee, which in 1944 submitted to the President and Congress a report that became the basis for the National System of Interstate Highways now being developed under the federal-aid highway program.

In his introduction, Commissioner MacDonald also paid tribute to the highway planning studies which have been made in the last three years under Mr. Kennedy's direction for legislative committees in six states.

The recipient of the Bartlett Award, America's highest individual honor in the highway field, is selected by a Board composed of the presidents of the American Association of State Highway Officials, the American Roadbuilders' Association and the Highway Research Board of the National Research Council.

The Board's Distinguished Service Award, which was established during 1948 for outstanding achievement in the field of highway research, was presented during the recent convention to Frank H. Jackson and Professor Charles H. Scholer.

Professor Scholer is on the faculty of Kansas State College. As Chairman of the Department of Materials and Construction of the Highway Research Board since 1935, he has provided stimulating leadership.

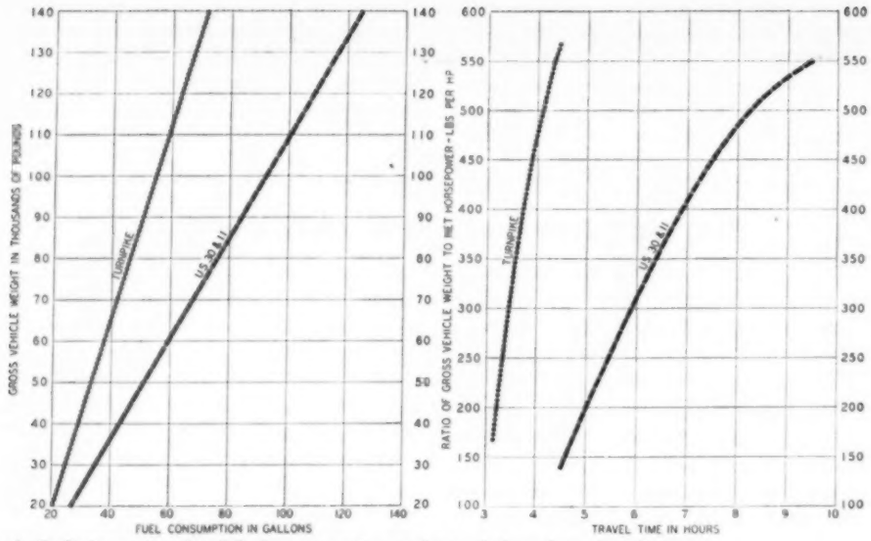
Mr. Jackson has been actively engaged for 43 years on research relating to the materials used in highway construction, and has contributed much that is noteworthy to the development of highway transportation. He is a member of the Department of Materials and Construction of the Highway Research Board, serving actively on many of its committees.

C. R. Hanes, Field Engineer of the Ohio Department of Highways, received the Highway Research Board Award for a paper of outstanding merit given at the 27th Annual Meeting of the Highway Research Board in December, 1947, entitled "Some Practices Used by Ohio in the Salvaging of Old Pavements." Mr. Hanes has been connected with the Construction Division of the Ohio Department of Highways for a period of approximately 25 years.

G. Donald Kennedy

F. H. Jackson

C. R. Hanes



★ Preliminary trends of fuel consumption and travel time data, in relation to weight characteristics, as developed in the Pennsylvania pilot study of heavy vehicle operation

they have found good use in specific problems involving soils, such as pavement base design, but added that there is little value in these systems for other engineering problems. Mr. Feld's paper planned to approach the problem from basic considerations and to outline the general classification of soils on the criteria of measurable strains of elastic, plastic, and fluid nature. In this way the results of forces acting on a soil are the basis of classification, not what constituents make up the soil.

Traffic Problems Deep

A thought-provoking slant on the whole problem of urban traffic congestion was presented by Professor Robert B. Mitchell, of Columbia University. Associated with the University's Institute for Urban Land Use and Housing Studies, this speaker said that traffic relief cannot be achieved by makeshift solutions. Although some fine arterial thoroughfares tap New York City, he observed, we must remember that major highways breed traffic. Shifting cars from one street to another, temporarily re-routing traffic, and other makeshift steps are not going to reduce the volume of traffic pouring into a metropolitan area. Travel confusion will continue to increase, he said, until a fundamental decentralization and redistribution of population take place.

The Professor urges intensive studies of business and industry with these problems in view, and development of metropolitan plans which will bring about betterment in land use and decentralization.

In New York, for example, he poses the question of how many people are encouraged to drive their cars to work instead of using mass transit, due to completion of new highway. He foresees eventual planning of new satelite communities around metropolitan areas.

Heavy Vehicle Performance

A tentative report of the Board's committee on economics of motor vehicle size and weight was presented in the form of a sound motion picture of the Pennsylvania Pilot Study.

The motion picture included some animation of selected partial and preliminary results of the tests intended only to provide examples of the kinds of data obtained and of the manner in which they may be used.

Also presented graphically (see accompanying chart) were some of the more generalized preliminary trends of the Pilot Study affording overall comparison of travel time and fuel consumption on the two contrasting test routes.

The Committee emphasized that these are only a fractional part of the total data which the final analysis of the Pilot Study will provide. The limitations of the partial data, which relate to the operation of selected gross vehicle weights over segments of the test roads, obviate valid economic comparison of different vehicles or vehicle types.

Further, the Pilot Study data, directed only to the development, under controlled conditions, of certain elements of direct cost expressed in terms of travel time and fuel consumption, constitute but a fractional part of the total factual data which will be required for a solution of the problems confronting the Committee.

Remaining phases of the study will necessitate the development of all elements of both direct and indirect hauling cost under actual operating conditions as well as complete data relative to the cost of providing highway facilities. The Committee's planned program contemplates intense case study of actual vehicle operation on various highways, economic analysis of the demand for various types of commodity transportation, and investigation of the cost of varied standards and capacities of roads and bridges.

The Committee emphasizes that no reliable conclusions can be drawn until all phases of the investigation have been completed.

Notebook Jottings at Meeting

There's still a shortage of data on the causes of accidents and the relation of accidents to highway design.

County and local roads in many states need reclassifying, as part of the over-all road program within a state.

★ ★

A 4-lane highway, not divided, incurs *four times as many accidents* on the average as a 4-lane divided highway.

★ ★

There's need to develop facts on the relationship of highways to the economic development of a state, past, present and future.

★ ★

All motors and trucks use all the highway system—we're all in the same boat as citizens, and we should never forget the fundamental importance of system planning.

★ ★

"Planners cannot foretell the future, but highway planners must make a good try."

★ ★

Each time the highway system has been upgraded in the past to meet automotive advancement (heavier roadbeds, more streamlined alignment, greater widths) a considerable part of the investment in highways has been lost. The next upgrading, when and if it ever comes, will make a terrific wrench.

★ ★

In discussing the preliminary findings of the truck economics pilot study (joint project with the Highway Research Board and other agencies) one spokesman noted that highway engineers must seek ultimately to provide lowest highway transportation cost. It is in the public interest to

(*Continued on page* 65)

Mechanical vs. Hand Loading

Loaders show spectacular cost advantage in Virginia ditch cleaning test project

By J. J. Forrer,
Maintenance Engineer Virginia Department of Highways, Richmond

THE information contained in this paper is compiled from data collected from the field engineers in charge of maintenance operations throughout Virginia only.

The Virginia department of highways maintains 9,000 miles of primary roads and 38,000 miles of secondary roads. As in most states, during and since the war, a very definite shortage of hand labor has existed. At the same time, naturally, many miles of ditches were becoming clogged with grass and washed-in debris. Inadequate drainage was causing excessive base and surface failures. Grader equipment, both one-man and tractor pulled, was available for pulling the material from the ditches onto the shoulders. The complete disposal of this material was a real necessity and presented a big problem. Labor not being available, it became evident that the loading of this material into trucks would have to be done by machinery. It was necessary that such a machine be capable of picking up wet or dry sandy or clayey materials containing grass, roots or small stones and load them into trucks working in line so that there would be a minimum of traffic interference. Also the machine would have to be capable of moving rapidly from one location to another under its own power.

Project committee report on maintenance costs presented at the Highway Research Board meeting, Dec. 6-10, 1948.

Problem of Comparison

In attempting to arrive at a comparison of costs it soon became obvious that practically every road had its peculiarities which reflected in the cost of the operation, i.e., the amount of material from the ditch, the kind of material handled, and the distance that the excess material had to be hauled for disposal, etc.

Disposal of the materials from ditches, within a reasonable haul, does not present any problem. The materials that contain good soil and grass are used extensively for top dressing slopes and fills. The materials that contain stones or clay are dumped uniformly over the fills. Often the material is given to citizens along the road for filling low spots in fields and house lots. It many cases the citizens are so anxious to get the materials that they will furnish trucks at their expense.

The wide variation in operations and locations accounts for the wide variations in replies received from the field engineers. Also the terrain in Virginia varies from the tidewater area in the east, rolling country in the central section and mountainous conditions in the west. The soils in each area are widely different, varying from sandy loams to heavy clays. *(Note table.)*

The machines capable of loading ditch materials are also used for many other purposes such as loading aggregates from stockpiles, light excavation work in widening narrow grades, and for loading snow. We are now operating in Virginia 85 mechanical loaders for these purposes.

It would be very desirable to have

Time Studies of Loading One Truck (3 cu. yd. load)

Test Number	Mech. Loading Aver. Time Recorded Min.	Hand Loading Aver. Time Recorded Min.
1	¼	3
2	½	5
3	⅔	10
4	⅔	12
5	1	12
6	1	15
7	1	25
8	1¼	17½
9	1½	25
10	2	10
11	2	12
12	2	20
13	2½	7½
14	2½	10
15	2½	15
16	3	10
17	3	15
18	3	12
19	4	20
20	5	12

Cost Studies of Loading One Truck (3 cu. yd. load)

Test Number	Mech. Loading Aver. Cost Recorded	Hand Loading Aver. Cost Recorded
1	$0.12	$0.70
2	0.24	1.33
3	0.25	2.88
4	0.33	1.63
5	0.39	1.55
6	0.43	1.23
7	0.72	2.13
8	0.78	4.07
9	0.81	1.65
10	0.91	3.17
11	0.92	2.19
12	0.95	1.50
13	1.01	2.06
14	1.05	2.01
15	1.32	4.89
16	1.67	5.87

Comparing Costs and Savings of Mechanical Loading of Ditch Cleaning Over Hand Labor

Mechanical Loading Costs Per Mile[1] (Both Ditches)		Hand Labor Loading Costs Per Mile[2] (Both Ditches)		Difference in Cost Per Mile	Estimates of Number of Laborers Replaced by Loading Equipment	
Test Sections	Cost Per Mile	Test Sections	Cost Per Mile		No. Engineers Reporting	No. Laborers Replaced
1	$ 40.00)	1	$274.00	$234.00)	1	25
2	111.00)	2	—	163.00)	1	30
3	51.16	3	482.60	431.44	2	40
4	23.65	4	76.39	52.74	4	50
5	75.00	5	130.00	55.00	1	80
6	128.58	6	500.00	371.42		
7	135.00	7	225.00	90.00		
8	100.00	8	165.00	65.00		
9	80.00	9	100.00	20.00		
10	95.00	10	165.00	70.00		
11	35.00	11	102.00	67.00		
12	62.13	12	275.92	213.99		

[1]NOTE—The engineers reported a rate of progress from 1 to 5 miles per day. The outfits consisted of: 1 foreman; 1 one-man or tractor-pulled grader and operator; 1 mechanical loader and operator; 4 to 5 1½-ton dump body trucks and drivers; 1 rotary power broom; 2 to 3 laborers.

[2]NOTE—The engineers reported a rate of progress from ¼ to ½ mile per day. The outfits consisted of: 1 foreman; 1 one-man or tractor-pulled grader and operator; 4 to 6 1½ ton dump body trucks and drivers; 12 to 16 laborers.

a machine that would clean ditches, and in the same operation load the material into trucks. Such a machine, so far as known, has not been developed. It is believed there is a definite field for such a machine.

* * *

Discussion of the foregoing paper by Mr. Forrer, following its presentation at the research convention, revealed a lively interest in maintenance equipment and maintenance problems generally. Some of the thoughts or facts expressed from the floor:

1. A mechanical brush and bush cutter is one of the most-needed machines. One that will work on a swivel, cut high and wide from a truck located on the shoulder, cut up brush, load it into the truck, etc.

2. We're all used to a "new" highway system, and are alarmed over rising maintenance costs. We should remember that as a system gets older and more stable in its development, a larger and larger proportion of the total expense will be for maintenance and repairs. Look at the railroads. Some day highway work may be 90% maintenance.

3. Higher rental rates are necessary on equipment today due to labor factors along the line We must make an even harder try to find cheaper ways of accomplishing work.

4. When a loader or other such unit is purchased, the maintenance department has a responsibility to lay out steady work for it. One part of the problem is to be sure that there are always enough trucks. In this spokesman's state (Iowa, Mr. Root speaking) trucks are sometimes transferred from adjoining counties to meet local needs.

New Pavement Joint Seal Installed Experimentally

A new joint seal consisting of preformed neoprene rubber was installed this past autumn in a number of test locations throughout the country. The product is an extruded rubber seal which fits over the divider plate in the concrete pavement joint and is securely locked in the concrete on either side, the top edge of the seal being ⅛ inch below the pavement surface. A steel installation cap is placed over the seal during pouring and removed when the pavement is edged. Longitudinal lane or centerline joints as well as full-depth contraction joints and expansion joints are included in the installations, which were made under direction of the engineers on the respective projects, the manufacturer cooperating.

The manufacturer is Lastite Joint Co., of Chicago, who claims the seal will not deteriorate, extrude above the pavement surface, and will require no maintenance. The test program included several federal and state highway projects, city street jobs, and municipal airports on which concrete pavements were being built during the late months of 1948.

Nails, Lovely Upturned Nails!

Why do contractors do it? Why do they let their workers strew nail-filled boards all over the place where bridge forms are under construction or being removed?

Of course the men can be drilled and rehearsed in the art of stepping carefully. With luck only a few of them will step on nails, and the accident record and lost time tally won't look too bad. Few men die of rusty nails, anyway, and then there is insurance to cover such matters.

Hardly a week passes but what we visit a job where those nails greet the eye. The accompanying snapshot is one of several we took recently, just to help suggest that someone for gosh sakes be assigned to do a little policing. Safety on the job pays. Safety usually consists of doing little things—like stacking naily boards out of harm's way.—*Editors.*

●

B. C. Budd, chairman of the Board of Directors of the International Road Federation, announced today the promotion of Robert O. Swain to General Manager and Secretary of the International Road Federation.

★ Left: Contraction joint complete with H-Bars, basket and seal, with installation cap over seal. Joiner plate in position before second half of center strip is staked in place and neoprene seal placed over center strip
Center: This shows contraction joint assembly with neoprene rubber seal and center strip in position with divider plate, which makes perfect alignment of center strip (also with neoprene seal) crossing the transverse joint
Right: Showing finished joint—note straighteners of joint and position of seal relative to finished surface. U.S. 27 south of Alexandria, Kentucky

★ Close-up of the grapple closed around a load of nine or so posts. Note hydraulic oil line leading from machine to a ram which actuates the grapple mechanism

Another example of the mechanization of a commonplace highway maintenance chore, with an analysis of the safety and other advantages gained, is given in the article below

Mechanical Handling Cuts Cost of

Creosoted Fence Posts

SEVERAL years ago the state highway department of Connecticut changed its standards on guard rail posts. Creosoted treated posts with a reflecting band were substituted in place of an untreated post painted white. Recently deliveries on treated posts have been sporadic. Shipments ordered for early spring might arrive on the hottest day in July. Creosoting plants were shipping posts almost immediately after treatment. Inadequate time was being allowed for posts to dry out in stock pile. Due to the condition of the materials market, many different kinds of wood had to be accepted.

Old Handling Hazardous

Among these varieties have been oak posts. These individual oak posts often weighed in excess of two hundred pounds. Due to the density of the wood the pressure treatment on oak did not penetrate to the depth of other wood. Consequently, more free creosote remained as a slippery paint course on the outside of the posts. The department was using hand methods for handling of posts.

The recently established division of safety of the highway department soon realized that something must be done to eliminate the mounting lost-time accidents arising in the process of handling creosoted posts. The weight of the posts themselves was a factor which produced bodily strains to those lifting the posts. The creosote and the vapors from the fresh creosote were a cause which produced skin infections and burns upon the workers. In one particular case, while hand unloading posts on a hot day from freight car to trucks, every man in a group of twelve, except the foreman, received creosote burns. At the time these men were fully clothed and wore gloves.

Since the creosoted posts had proven to be very serviceable and economical in use, it did not seem advisable to change the standard regarding posts. Thus the problem became one of receiving shipments only in cold weather, of providing further protective clothing upon the men, or of mechanical means to eliminate as much hand work as possible.

The present conditions of the material market precluded the first remedy. Furthermore, the handling of round posts in freezing weather might produce further hazards.

Consideration was next given to the furnishing of jumpers to workers. Experience with cloth jumpers has shown that ordinary cloth soon becomes saturated with creosote and soon the cloth in itself, next to the body, creates a worse hazard. To furnish new jumpers to all the men every day was out of the question. Experience with leather and plastic clothing brought forth the fact that workers would not wear such on warm days. Even though some suitable clothing might be found to protect the body, such clothing would not protect the face. Several protective creams were tried but proved to be ineffective due to perspiration.

A Simple Solution

The Bureau of business administration of the department located a mounted hydraulic crane with a claw type bucket which was especially designed for handling posts. Arrangements were made with the private owner to rent this machine. The department's maintenance men agreed to try this method out. The tryout took place at Newington, Connecticut, on August 10 and 11, 1948.

Posts were unloaded from two cars using hand methods. Posts were unloaded from five cars using mechanical means. The posts were newly-treated, heavy oak posts which were still wet and slippery with creosote. Free creosote was found in portions of the bottom of the cars. Using the mechanical method, the posts were unloaded at the Newington Freight

Yard by machine direct onto a flat-bottom trailer truck. The railroad cars contained from 400 to 525 posts in a car. The trailer had a capacity of approximately 300 posts. The claw-type bucket could handle 10 posts per grab.

The trailer truck and crane then proceeded to the Newington Yard of the highway department, a distance of 3 miles. The crane then unloaded the posts of the trailer and placed them in orderly stock piles. Both pieces of equipment then proceeded back to the freight yard and the operation was again duplicated. Although the weather was very hot, the posts were handled easily and without any injuries or unpleasant conditions for the men. Comparative costs of the two methods are as follows:

Unloading Posts Old Way—2 cars in One Day

7 Men—9.5 Hrs. @ $ .91		$ 60.52
2 Men—9.5 Hrs. @ .96		18.24
1 Man—9.5 Hrs. @ 1.01		9.64
2 Trucks—9.5 Hrs. @ 1.35		25.65
Cost		$114.05
Average Cost for 1 Car		$ 57.03

Unloading Posts with Machine—5 Cars in Two Days

2 Men—19 Hrs. @ $ .91	$ 34.58	
2 Men— 4 Hrs. @ 1.365	10.92	
1 Man—19 Hrs. @ .96	18.24	
1 Man— 4 Hrs. @ 1.44	5.76	
1 Man—19 Hrs. @ 1.01	19.19	
1 Man— 4 Hrs. @ 1.515	6.06	
1 Trailer—23 Hrs. @ 2.50	57.50	152.25
Rental of Crane— 23 Hrs. @ 8.25		189.75
Cost		$342.00
Average Cost for 1 Car		$68.40

Actual time studies showed that 5.0 posts per minute were actually unloaded from flat-bottom coal cars and placed on a trailer and that 7.1 posts per minute were actually unloaded from trucks and placed into stacked storage piles.

These figures show that on the first trial basis the mechanical method cost slightly more than the hand method. However, considerable saving can be made in costs by the department purchasing a similar machine. In this manner the rental charges could be greatly reduced. The number of cars per year unloaded by the bureau of maintenance might even justify the purchase of two machines. Consideration is now being given in the budget for such additional equipment. Further saving may be obtained by specifying that creosote plants load the posts crosswise of the car rather than lengthwise. In the trial referred to, the posts were lengthwise of the car and had shifted in transit. This shift caused overlapping of posts which slowed up mechanical handling. It is also reasonable to expect increased efficiency in mechanical handling when men become more experienced in this method.

Profitable Innovation

Even if the costs of mechanical method should prove to be slightly higher in operation (a fact which seems at this point to be a doubtful assumption) the savings in lost time, compensation and medical payments warrant the adoption of mechanical methods. It is well to mention that the State carries its own insurance.

As an additional precaution the department intends to issue leather gloves and split-leg leather aprons with shoulder protection for those men who have to jockey posts in place by hand on small replacement sections.

These comparative tests were run under the auspices of the following officials: A. L. Donnelly, director, bureau of maintenance; R. L. Booth, supervisor district 5, bureau of maintenance; R. R. Coffey, unit head, bureau of business administration; and E. T. Nettleton, safety engineer, division of safety. The hydraulic crane was rented from the National Fence Company of Meriden, Connecticut.

PCA Announces Research Personnel Changes

Three important changes in the research personnel of the Portland Cement Association have been announced by Dr. A. Allan Bates, the Association's Vice President for Research and Development.

Harrison F. Gonnerman, Director of Research, is advanced to Assistant to the Vice President for Research and Development. Mr. Gonnerman fills the vacancy created by the retirement from active service of F. R. McMillan, who has held that post since January, 1947.

Hubert Woods, Research Director of the Riverside Cement Company of Los Angeles, Calif., since 1926, has been chosen Director of Research for the Association.

Mr. Gonnerman joined the Association staff in 1922 as an Associate Engineer, and served as Manager of the Research Laboratory from 1927 until January, 1947, when he was appointed Director of Research.

Mr. McMillan's retirement from active service comes after 24 years with the Association. He joined the Association in 1924 as an Associate Engineer, was appointed Manager of the Structural Bureau in 1926, Director of Research in 1927, and Assistant to the Vice President for Research and Development in January, 1947.

Coming Meetings

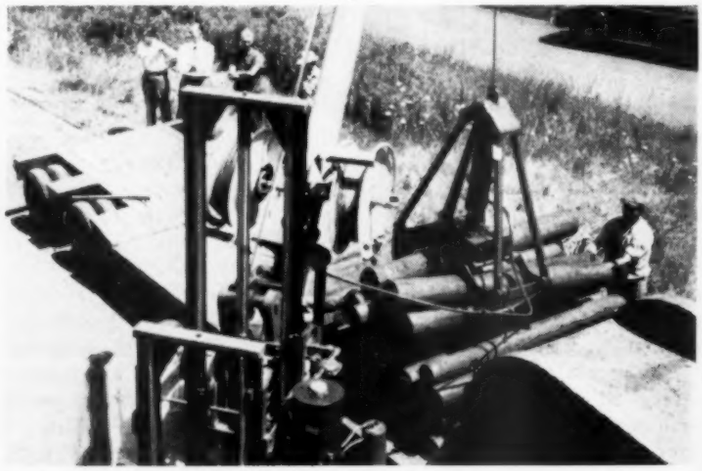
American Road Builders' Association; annual convention; Washington, D.C., Feb. 7-9.

National Crushed Stone Assn., 32nd annual convention; New York; Hotel New Yorker; Feb. 7-9.

National Ready Mixed Concrete Assn., 19th annual convention; New York; Hotel New Yorker; Feb. 14-18.

National Sand and Gravel Assn., 33rd annual convention; New York; Hotel New Yorker; Feb. 14-18.

Associated General Contractors of America, Inc.; annual convention, Waldorf-Astoria Hotel, New York City, Feb. 28-March 3.



★ Unloading from gondole to flat-bed. Posts are stacked cross-wise and a large number is thus hauled each load

Pick Ford Power-Right 3 Ways

1 RIGHT POWER — for your application, with a choice of five rugged new models now available in the Ford Industrial Engine line.

2 RIGHT FEATURES — all the latest advancements of Ford's "out-front" engineering are incorporated in Ford Industrial Engines.

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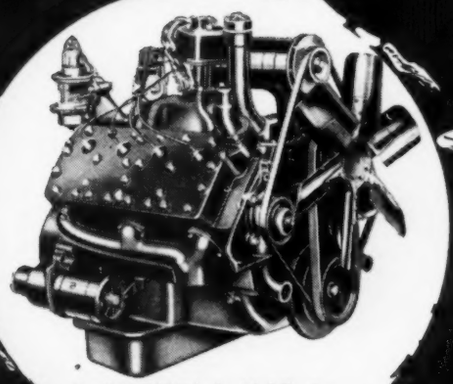
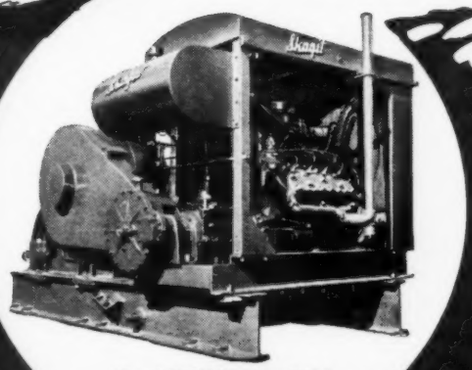


Ford 337 V-8 Industrial Engine
(337 cu. in. displacement)



Skagit B-30 logging hoist, using Ford 337 V-8 Industrial Engine.

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FORD MOTOR COMPANY
INDUSTRIAL AND MARINE ENGINE SALES DEPARTMENT
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FIELD PROVED

Unique 9 Part Fabric

Its patented construction is entirely unlike any other. Scores of wires are stranded in 9 parts, then into three parts.

Interlaced By Machine

On special precision machines, originated by Union Wire Rope engineers, three three-strand parts are so interlaced as to form a sling fabric so much stronger, with so much tougher wearing qualities and with so much more flexibility that you just have to see how much longer service it gives to believe it.

Constructed To Prevent Rotating of Load

The inequalities of hand made slings are eliminated. The parts of Tuffy Sling fabric are so uniquely interlaced that they neutralize the load torque which causes rotating of the load on straight pulls.

Tested Strength Is Twice Safe Working Load Limits

Metal tags on Tuffy Slings give their safe working load. Each sling or leg of a bridal sling is proof-tested to twice this safe working load.

95% of Fabric Strength Is Developed In the Eye Splices

Here the unique interlacing of Tuffy scores again. It permits ready forming of eye splices possessing 95% of the strength of the sling fabric.

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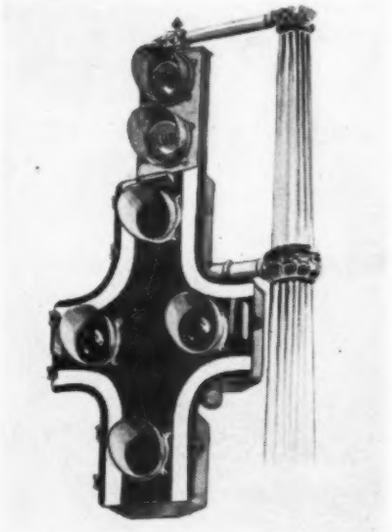
UNION WIRE ROPE CORP

union Wire Ro

D. of C. Tries New Directional Traffic Signal

A NEW type of traffic control signal was installed without cost to the District and on a purely experimental basis at 14th and F Streets, N.W., on February 19, 1948.

Considerably larger than the standard signals now in use, the experimental signal (see sketch) has a diagram of the intersection attached to the face below the stop and caution lights. This diagram contains three green arrows—one controls through traffic and the others left and right turns. Prohibitive movements are indicated by red bars placed next to the arrows.



According to the manufacturers (Bristol Steel & Iron, Bristol, Tenn.) the signal has been designed to clear the movements which may and may not be made at special intersections.

Since the installation of this particular signal, according to D. of C.'s director of vehicles and traffic Geo. E. Keneipp, the Department has received no unfavorable public comments other than one query. The green bar at the lower part of the signal apparently was intended as the follow-through or end portion of the arrow controlling through traffic. The single bar, however, proved confusing to traffic and since has been shut off.

More Radio Use in Pennsylvania

Following successful tests during the 1947-48 winter in Erie and Cambria counties the Pennsylvania department of highways planned to install radio facilities in its equipment in sixteen additional counties for use in snow removal work. The installations will be in counties where snow removal work is the heaviest. In eleven counties the radio service offered by public utilities will be uti-

lized. The companies will provide all equipment and handle all maintenance on a monthly rental basis. The department in the other seven counties will purchase and operate its own radio system under authority granted by the Federal Communications Commission.

Last winter the department experimented with radio equipment in two counties, consisting of land stations located in the county maintenance building and mobile units on heavy trucks and cars of supervisory personnel.

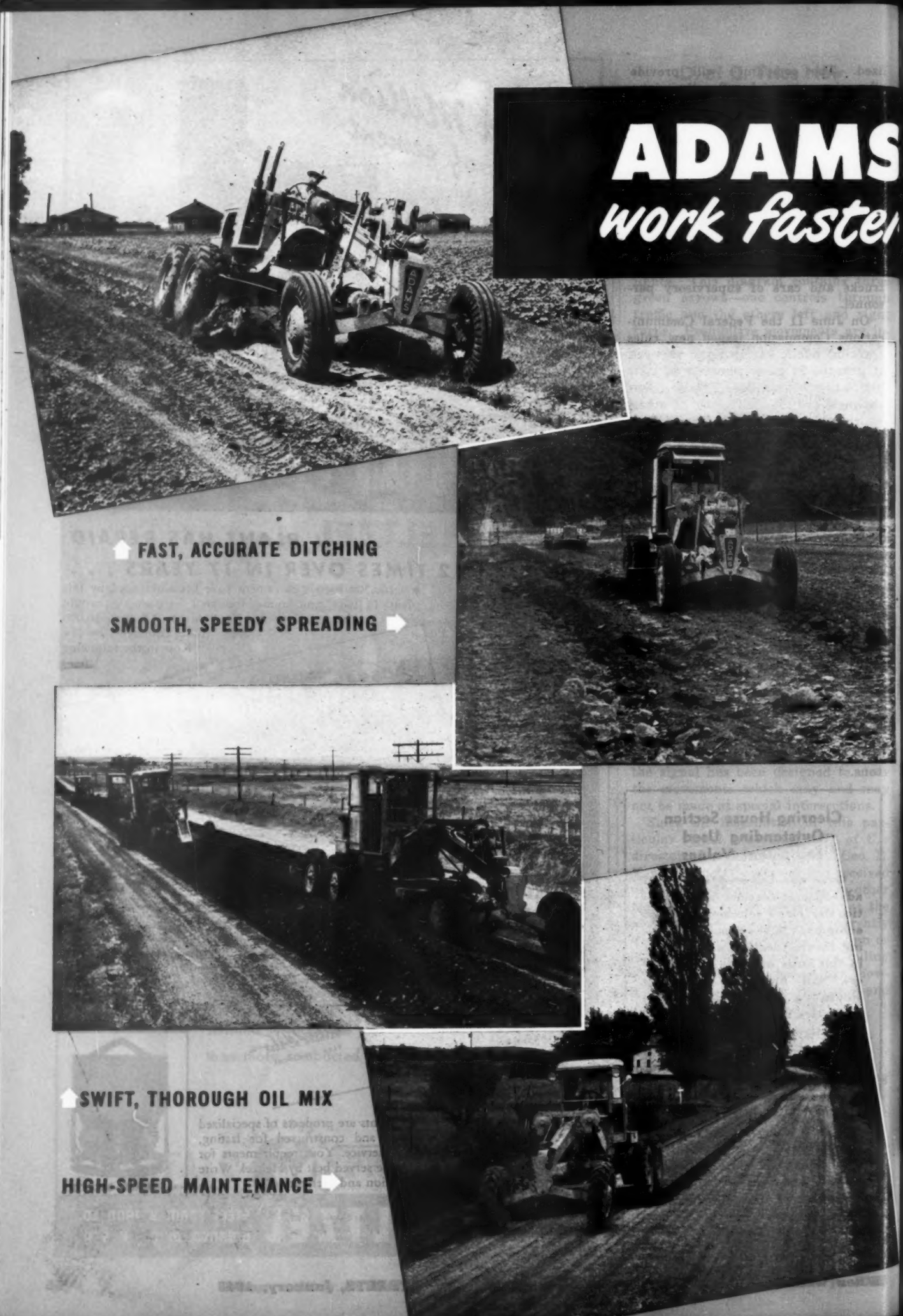
On June 11 the Federal Communications Commission issued new rules covering public safety radio services. It granted 24 clear channels to state highway departments. These clear channels are in addition to 11 others which are available on a shared basis.

Tonnage of Slag for Road Use

The importance of blast-furnace slag in construction and road work is shown by figures released for 1947 by the U.S. Bureau of Mines. Of the total production of 19,581,679 short tons, 16,712,177 tons consisted of screened air-cooled slag. Of this total, 15,426,367 tons, or 92%, was used as railroad ballast, concrete aggregate, aggregate for bituminous construction and for miscellaneous highway construction use and the manufacture of concrete block. Bituminous construction took 4,300,000 tons, road and street use other than as aggregates took 4,780,000 tons, and concrete aggregate took 1,600,000 tons.

Clearing House Section Outstanding Used Equipment Values

Over one hundred individual advertisers feature an exceptionally large selection of used equipment in the 9-page "Clearing House" section which starts in this issue on page 96. Readers will find the "Clearing House" a dependable and informative directory of outstanding values in used equipment and we suggest that you make perusal of these pages a regular habit each month. At any time that you have equipment you wish to sell, anywhere in the country, we suggest that you present your offerings in our "Clearing House." This section is growing faster, getting larger every month, because it's doing a better, quicker selling job—at one low cost!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work faster
FAST, ACCURATE DITCHING
SMOOTH, SPEEDY SPREADING
SWIFT, THOROUGH OIL MIX
HIGH-SPEED MAINTENANCE

...S MOTOR GRADERS
...ter ... do more work per day

Action! Fast action! The kind that pays big dividends in time saved and work accomplished . . . that's exactly what you can expect, and what you get, with Adams Motor Graders on the job.

The reason: Adams 8 overlapping forward speeds provide instantly the *right* working speed for accomplishing each grading operation at the fastest practical rate. This is particularly important on such sustained-speed work as ditching, spreading, scarifying, oil mix and maintenance. And there's the big plus advantage of high job-to-job transport speeds—up to 25 mph.

Obviously, right working speeds do not alone insure efficient performance. There must also be rugged, dependable power; strong, rigid construction; balanced weight distribution; precision mechanical controls. You need them, one and all . . . and you get them all in Adams Motor Graders. Let your local Adams dealer show you the model best suited to your needs.

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RAPID JOB-TO-JOB TRANSPORT

Make your next motor grader an

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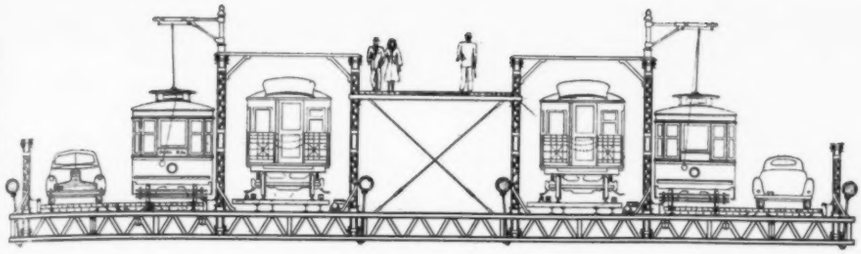
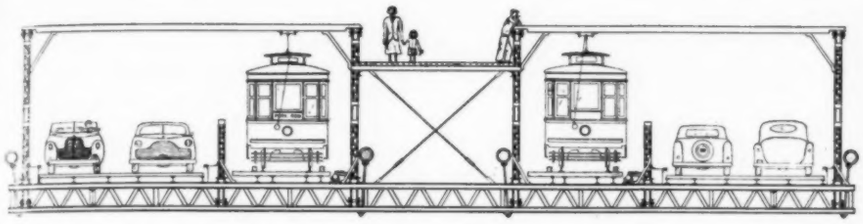
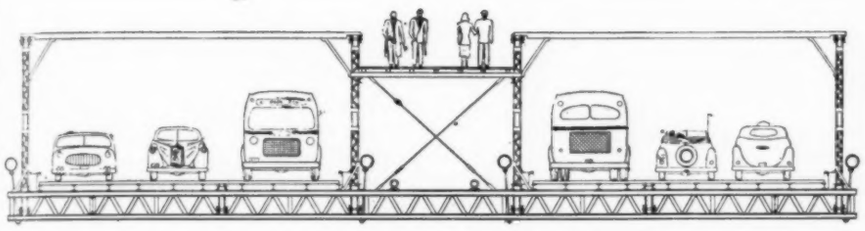


INITIAL STAGE



PROPOSED INTERMEDIATE STAGE



PROPOSED FINAL STAGE

★ Brooklyn Bridge—proposed stages of reconstruction. D. B. Steinman, consulting engineer.

Brooklyn Bridge to be Modernized

The world famous Brooklyn Bridge, a landmark in bridge pioneering and for 65 years an indispensable link in New York City's traffic system, is soon to be modernized. Plans are in preparation by David B. Steinman, consulting engineer, for converting the old narrow 2-lane roadway into a modern 6-lane concrete highway across the bridge. Trolley car tracks will be removed, and the present traffic capacity of 20,000 vehicles per day will be increased to a peak capacity of 6,000 vehicles per hour. According to a published report from the office of Frederick H. Zurmuhlem, commissioner of public works, the cost of the modernization will be more than $5,000,000. The bridge originally cost $25,000,000 to build back in 1883, when the American dollar was worth only about one-fourth of its present value in purchasing power.

The present stiffening trusses will be renovated and moved to new positions. The changes, including the new floor, take advantage of the fact that the original design provided for the possibility of greatly increased future load.

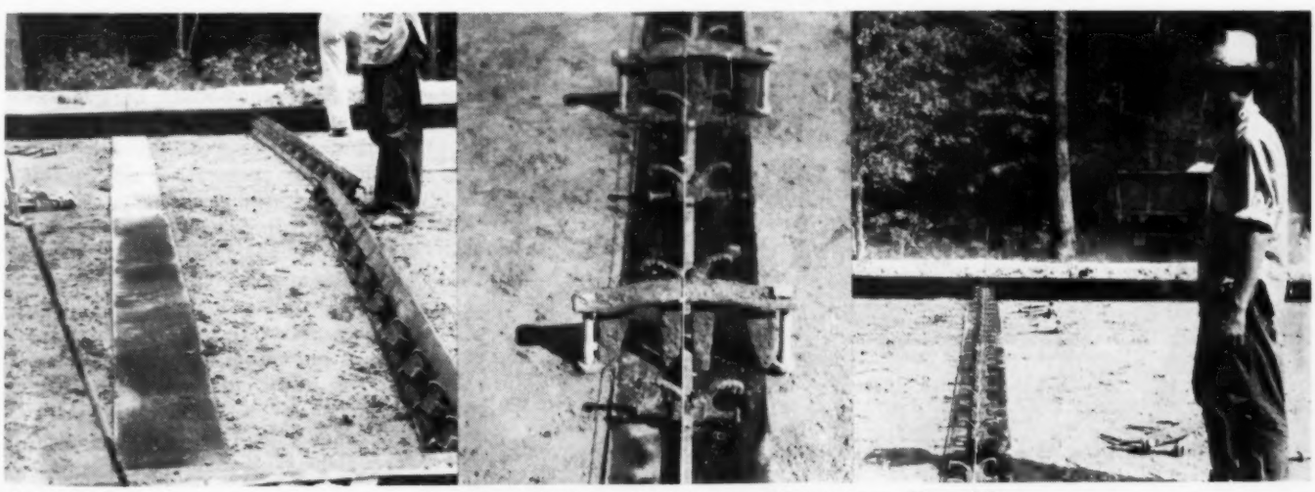
Mastic Base Plate Tried Under Joints

USE of base plates of asphalt mastic board under concrete pavement joints is being tried experimentally by the Texas highway department. An installation was made during 1948 on a road project in Orange County, in a swamp area which has soils and drainage conditions ideal for the development of pumping where subgrades are untreated.

This device is being used in an attempt to seal the subgrade, since either sealing of expansion and contraction joints or expensive permanent stabilization of the roadbed was considered necessary here to forestall pumping.

The base plate installation shown in the photos was made in conjunction with a joint to which are affixed patented load transfer units (Starr). The plates were furnished by Keystone Asphalt Products Company. The highway department engineers hope to obtain data on the effectiveness of this plate arrangement to prevent seepage from the subgrade and to prevent infiltration of subgrade material into the joint. The installation is similar to ones made by the Michigan state highway department more than a year ago with satisfactory results reported to date.

The Texas installation was made under the supervision of J. D. French, supervising construction engineer (concrete), Texas highway department.



★ Mastic board base plate in position on subgrade, ready for setting joint assembly; joint assembly and base plate in place; load transfers and joint material were held in position by special temporary devices noted, used for this purpose by the contractor

JOB and EQUIPMENT IDEAS

Walkie-Talkies Used by Surveyors

SURVEYING crews of the Adams Electrical cooperative are speeding up their work in Adams County, Illinois, by using "walkie-talkies"—the 2-way radios originated during the war. The cooperative is the first in the United States to use field radio outfits for work of this type.

As described in the Quincy (Ill.) *Herald-Whig*, one unit of the walkie-talkie in this county is carried by the man who operates the surveying instrument; the other unit is carried by the staking crew chief. The chief accompanies the rodman and the staker, and by means of the walkie-talkie, the rodman can be aligned with the surveying instrument, even though he himself is unable to see the instrument man.

Without radio equipment it has always been necessary to use arm signals or to yell for communication between rodman and instrument man. The walkie-talkie has enabled the crew to stake from a third to half more miles of line than formerly was possible.

Walkie-talkie units weigh seven pounds, and are carried by means of shoulder straps. The earphone and microphone are contained in a cradle-type set, similar to the modern telephone receiver and transmitter. This is strapped on the shoulder, leaving the hands free for other work.

Conversations can be carried on between these portable units over distances of from 2 to 3 miles. They operate on the same frequency—37.62 megacycles—as other 2-way radio equipment installed in the line trucks and at the main office of the Adams Electrical co-operative in Camp Point. The portable units can communicate with the other line trucks, and with the co-op's main station. The range from portable unit to trucks is 5 to 6 miles, and approximately 10 miles lies between the main office and the unit.

The portable units will also be used by the line trucks during storms when it is necessary to patrol private rights-of-way on foot. The man who is patrolling can communicate immediately with the trucks when he locates trouble, thus saving many hours of outages.

Permission is being sought from the Federal Communications Commission to carry one of the portable units by airplane. Planes are used to patrol lines following severe storms. By means of the walkie-talkie a pilot could direct crews immediately to damaged areas which he observed when flying over the lines. Three employes in addition to the manager of the Adams Electrical co-op are licensed pilots.

Tower Truck Serves Light Repair Crew

A saving of time, and reduction of hazard in the maintenance of overhead traffic lights will be effected when the Connecticut state highway department's new 1½-ton tower truck is put in operation. Previously, when an overhead light needed repairs it was necessary to climb a ladder, usually placed in the middle of a street intersection, and leaned against overhead cables. This procedure was neither safe nor efficient.

The new truck is equipped with a hydraulic lift platform which can be raised to a height of about 20 feet, sufficient for most requirements. The platform is equipped with a hinged safety rail and can be raised or lowered by the man working on it.

A reflecting mirror, called commercially a cab-o-scope, is set into the roof of the truck's cab, thus enabling the driver to spot the platform directly under the ailing light. An ambulance-type, oscillating light is also mounted on the roof of the cab to attract the attention of motorists to presence of truck while stopped on road.

The closed body of the truck is a storehouse for electrical equipment and tools needed in the work. It will also carry an extension ladder.

The truck is assigned to the department's highway marking section, division of highway control.

Small Self-Powered Scrapers Stretch Maintenance Dollars

ALMOST every day we hear of some new mechanization of highway maintenance and repair work that is paying dividends. One of the latest examples is the use of the fast, new, self-propelled scrapers for such work as opening up and hauling out local pit material for surfacing, repairing rough spots in earth and gravel roads, and keeping ditches well formed and cleared.

The Mississippi state highway department illustrated the economy and speed of scraper work recently while patching low spots along the Forrest-Sebastopol highway, near Forrest, Miss. According to data from the central maintenance district at Newton, Miss., the road in question was a clay road with sand topping. A sand-clay topping material was moved out of various pits along the way. The crew also repaired rough spots and filled in low places where water might collect. The roadway is 30 ft. wide—a typical farm-to-market road of lowest cost.

Previously it had been necessary to use one motor grader, one loader and three trucks to complete one mile of

surface, shoulder and ditch on one side only. A 7-yd. self-powered scraper, with only half as many men working, was able to cover 6 miles in one day under these particular conditions, cleaning up both sides of the road.

Of course conditions vary on every job, and motor graders, loaders and other power units each have established themselves because of their versatility. But the possibility of using scrapers, either tractor-drawn or self-powered, is one that not every county or state highway maintenance unit has as yet fully explored. The scraper used on this job, (pictured right) a LeTourneau D. Roadster, is typical of the newer self-powered rigs in that it has speeds up to 25 mph, and embodies refinements that add to versatility, which is one of the chief concerns of the maintenance superintendent in getting his money back on the equipment.

How to Align Wobbling Pulleys, Sheaves, etc.

W. F. Schaphorst, M.E.

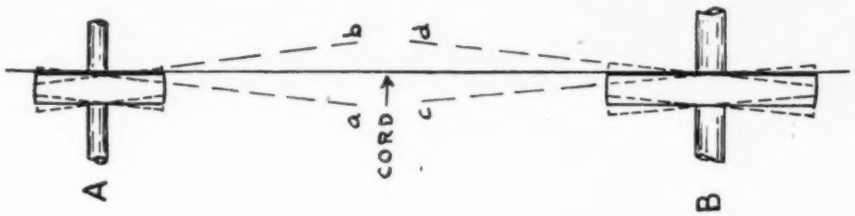
The principal trouble with all of the articles this writer has ever seen on the alignment of drives is that they deal only with non-wobbling pulleys, sprockets, sheaves, etc. Nothing whatever is ever said about wobble. To be sure, perfect drives do not wobble, but, as every user of drives knows, they often *do* wobble, particularly those that are large in diameter. Besides, nobody has ever yet beheld a *perfect* drive, and it is safe to say nobody ever will.

The accompanying sketch shows the "worst" case of wobble in which both the pulleys wobble. A cord pulled taut and "just touching" the diametrically opposite edges of pulley A will move from extremes a to b as the pulley is rotated, as shown by the dotted lines. The pulley is drawn in dotted lines in its extreme positions and in solid lines in its mid position. The thing to do is to find its mid position, as shown by the solid lines. The mid position, of course, is midway between extremes a and b.

Then do precisely the same thing with pulley B which varies from extreme c to extreme d when it is rotated through one complete revolution. Find the mid-position in the same way as explained above and as indicated by the solid lines.

And finally, after locating the mid positions of both pulleys A and B, align them as pictured by the solid lines so that a taut cord will "just touch" opposite points of both pulleys, thereby putting them in best working alignment even though they do wobble.

In the accompanying sketch the wobble is shown considerably exaggerated. This was done purposely to make certain that the method of procedure will be clearly conveyed to all readers. It is often necessary to exaggerate drawings for this reason.



Diesel Fuel from Trailer Tank

This elevated tank, seen on Jutton-Kelly's downtown Fort-Jefferson Connection project in Detroit, is all ready to be set back on a pair of trailer axles, time it's needed again for over-the-road deliveries. It was used here to re-fuel diesel trucks and cranes for the job duration.

Trailer Unloads Finishers Onto the Forms

Concrete pavement spreader, finisher and other form-riding equipment were unloaded from a trailer directly into position on the forms, in paving various parcels in a Michigan city this past season. Loselle Construction Co. of Wyandotte, Mich., the contractor, utilized this time and work saving method, their practice being to bring the equipment along a cross street at the beginning or end of the work and load or unload with improvised ramps as pictured here.

Airport Runway Base Construction with

Emulsified Asphalt and Sand

. . . as employed successfully on an army airfield on the Gulf Coast, built in wartime haste under adverse drainage conditions

By V. L. Taylor

J. T. Irwin, Inc., Mobile, Ala.

THIS report covers the construction of a base course for a large airport on the Gulf Coast by the use of emulsified asphalt and sand, under the rush of wartime construction and against very adverse weather conditions.

The site lies three miles northeast of Gulfport, Mississippi. The runways were located on ground between two tidewater Bayous, average elevation 18 ft. above mean sea level. The soil, locally called "crawfish mud" due to the great numbers of chimneys constructed by these crustaceans, consisted of a silty loam topsoil several inches deep, underlaid by silty sand to a depth of two or more feet, under which was a fairly impervious layer of clayey material several feet deep. During the wet season the whole area became soggy and quaked under construction equipment. The vibrations of the equipment worked the soil into a mushy quicksand. The site was originally "donated" for a CAA airport, and was under construction, as such, at the time it was taken over for an Army airfield.

Drainage Difficulties

The writer was assigned to this project while the CAA contracts were still in force, and can testify that the usual method of grading the runways from side borrow ditches could never be successfully done in the time allowed, due to the previously mentioned soggy conditions. The contractor had dug many drainage canals on the site in an effort to dry up the runway and intermediate areas sufficiently to accomplish the 310,000 cu. yd. of necessary grading.

These ditches failed to drain the area due to the high capillarity of the soil and the underlying strata of clay. Water stood in the ruts only a few feet from the ditches. The original plans called for three 5,000 ft. runways, 150 ft. in width, the shape of an "A," together with warm-up aprons and taxiways.

Presented at the American Road Builders' Association meeting last July in Chicago.

Under pressure of the army airfield construction program, it was evident that "something had to be done." After much study it was decided that a hydraulic fill could be economically placed from a sandy borrow area in the Bayou directly north of the field. All parts of the contract not in keeping with this scheme were cancelled.

The embankments were placed with a 26 in. hydraulic cutterhead dredge, the maximum length of dredge pipe being just under three miles. Grades were established which would provide a minimum fill of 3 ft. at pavement edge. All grading up to the point of fine-grading was then done by purchase and hire methods by the U. S. Engineer Department, the writer being in responsible charge. Shortly after the hydraulic fill work got under way, bids were taken for base course and pavement. These bids allowed for three principal alternates: 8"-6"-6"-8" concrete pavement; 8-in. compacted shell base course with 2-in. asphaltic concrete wearing surface; 8-in. bituminous base course with 2-in. asphaltic concrete wearing surface.

535,000 sq. yd. of Base

Contract was awarded to Murphy Construction Co., Morgantown, W. Virginia, low bidder, on the last named alternate. The price, about $0.97 per sq. yd. included furnishing and blending in about 1 in. of silt with the pumped-in sand; fine grading; mixing; and compaction. The contractor elected to use emulsified asphalt in the base course, which, in turn, was supplied by the American Bitumuls Company. The use of this alternate by the contractor was well chosen, as may well be understood due to the high rainfall on the Gulf Coast, and the ever-present run-off water from the hydraulic fill operation. The fill was retained to within a foot of the finished grade in many places by the system of dikes constructed to retain the solids.

Bids were taken based on about 300,000 sq. yd. of pavement. But before completion, two runways were extended to 7,000 ft. and the third to 6,000 ft. Circumferential taxiways and hardstandings were added, bringing the total of bituminous base course to about 535,000 sq. yd.

Special Emulsion Specs

Sand aggregate for the base course was to have a minimum stability of 30 psi. at 1:75% moisture content, as determined by the Florida state road department bulletin, entitled "Sand Bituminous Road Mix Pavements." Also a maximum liquid limit of 20 with a maximum plasticity index of 4, and a maximum clay content by elutriation of 6%. The maximum percentage of aggregate passing the 200-mesh sieve was to be limited to 12%.

Requirements for emulsified asphalt were as follows:

	Min.	Max.
Viscosity, Furol @ 77° F., Sec...	20	100
Residue by Distillation.....	60	65
Settlement, 5 Days.....		3
Demulsibility, 50cc N/10 $CaCl_2$..		1.0
Sieve Test—Retained on 20 mesh		0.10
Miscibility, 2 hrs.....Pass		
Cement Mixing, % max.....		2.0

Although not stated in the specification requirements, the emulsified asphalt was "Job Engineered," being treated to adhere to hydrophilic aggregates, and it also met a dehydration test of not less than 0.60 when tested at 100°F. for 96 hours. Both of these requirements are essential for this type of construction. Many sands are hydrophilic, and for this reason better results will be obtained with a material treated to adhere to such aggregates. The dehydration test is essential, because this test requires a material that will set uniformly throughout the entire depth of the base course.

The specifications further provided for the use of sufficient emulsified asphalt in the base course to secure a residual bitumen content of 4½% to 10%. Also provision was made for the use of the following formula as a check on the correct amount of emulsified asphalt.

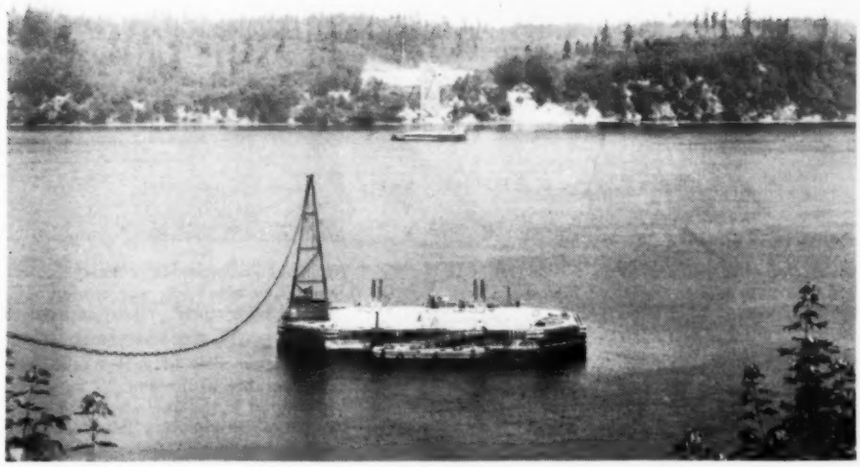
P = (.05A plus .12B plus .6C) x K in which P equals total percent by weight of emulsion

(*Continued on page 77*)

Construction Begins on New

Tacoma Narrows Bridge

$11,200,000 structure being built to more conservative design. Most of sub-structure salvaged, including two main piers. Completion by April, 1950, hoped for despite steel situation



★ Site of Tacoma Narrows bridge reconstruction—looking west from the east anchorage. Repairs on piers No. 4 and 5 in progress, as of July 12, 1948, with original concrete pedestals removed down to the pier base. Note old viaduct approach and tall west-shore tower No. 3 in distance

By A. R. MacPherson

CONSTRUCTION has finally commenced on the new Tacoma Narrows bridge which will replace the ill-fated span that collapsed in a storm Nov. 7, 1940. The disastrous failure of the original $6,400,000, mile-long structure, a few short months after its opening, shocked the engineering world.

As a result, bridge engineers spent several years in an extensive research at the $100,000 wind tunnel at the University of Washington in Seattle. They experimented with 30 different designs of suspension bridge models, testing them with wind velocities up to 100 miles per hour in the wind tunnel. Thus, the final bridge plans as presented to the builders represent the most thoroughly tested design in the history of suspension bridge construction.

★ Working equipment crowded on pier No. 5 during early summer, consisting of a portable concrete Mixermobile, Wagner Towermobile, and Lima crane (unloading sand and gravel from barge)

The difference between the contract price of the new bridge set at $11,200,000 and the original bond issue of $14,000,000, is to take care of several other phases of the project —to pay interest on the bonds during the construction period and for a 6 months period after completion of the project; to maintain an engineering contingency fund of $700,000 to meet any emergencies or unplanned costs of construction and to pay for insurance on the bridge.

Woodworth & Co. of Tacoma, subcontractors to Bethlehem Pacific Coast Steel Corp., builders of the new bridge, are now well along with reconstruction of the piers and anchorages for the new bridge. Following the collapse of the first span 8 years ago, salvage operators completed demolition of the 500-ft. high warped towers, unspun the many miles of wire in the original 17-in. cables and junked the metal.

The new bridge, considerably enlarged and strengthened over the first span, will possess none of the disastrous characteristics that caused one of the greatest engineering feats of the last decade to shake itself to pieces in a comparatively mild storm. According to Charles E. Andrew, designing engineer and builder of the bridge for Washington State Toll Bridge Authority, the piers, anchorages and approaches used for the first

★ (Left): Beginning concrete work for reconstruction of the east anchorage. Key block for rear corner being cast, using a Foote paver, boom replaced by a chute. Vibration used throughout

★ Another view of east Anchorage concrete work. New structure will be considerably wider and 20 ft. longer than the old structure which will be enveloped in the new after first cutting it back. Old surfaces are left rough and new construction joints doweled and "roughened" by shoe prints, to aid in bonding. Concrete work here will be brought up to full height in accordance with an essentially rectangular design. 26,000 cu. yd. in new pier, compared with 20,000 cu. yd. in old

span will also serve to support the new bridge after considerable rebuilding and enlarging of the piers and anchor blocks.

No Underwater Work

The two channel piers on which the pedestals supporting the towers will be erected are still intact. According to Mr. Andrew there will be no underwater work involved in building the new bridge since the two piers were not even dented by the collapse of the bridge proper. While the weight of the steel superstructure—towers, cables, trusses and decking—of the new bridge will be increased 160%, the total weight of the bridge will be increased by only 6%.

Careful inspection of the old piers determined that they were fully adequate to carry the heavier load of the new span. This will result in a saving of $3,500,000 in the total cost of the new bridge. However, several thousand tons of rip-rap quarried rock will be dumped around the bases of the piers to reduce tidal erosion since the fast tides tear at the piers at speeds up to 8 miles per hour.

The piers when built were driven 94 ft. into gravel at the bottom of Puget Sound. They rise 130 ft. through the water to the surface of the Narrows, while the new towers will rise 507 ft. above mean low tide. Dimension of the piers proper at the bottom are 117.5 x 64.5 ft., and at the top, 137.5 x 84.5 ft. There are 32 cells in each pier, of 12 x 13 ft. inside dimensions. The inside wall of the cells is 2 ft. thick and 3¼ ft. thick outside.

New Towers Wider

Tower legs for the new bridge will have a vertical center of 60 ft. as compared with 50 ft. at the base for the old bridge. An average direct load on the bottom of the piers is 7.65 tons per square foot.

Demolition of the original pedestals on the channel piers was accomplished without dynamite in order to save the steel reinforcing bars which were used to key the new concrete. Holes were drilled into each pedestal and special wedges inserted to split off the old concrete.

The new pedestals now poured and completed are 18 feet higher than the original ones in order to prevent salt water spray from reaching the steel towers. Dimensions of the pedestals at the base are 32 by 31 ft., tapering upwards, with 700 cu. yd. or approximately 1,400 tons of concrete making up each one. Tower load on each pedestal is approximately 9,000 tons. A hollow slightly larger than the foot of the steel towers was left in the top of each pedestal and the concrete mass allowed to cool for 21 days. Then a steel grid was placed in the hollow atop the pedestal and leveled by jack screws, after which concrete was deposited and struck off with a steel bar, thus enabling engineers accurately to level the concrete base on which the steel towers will rest.

Interesting to relate, an inspection

★ Pier 6 on the east shore undergoing enlargement. New wide spacing of column supports in relation to old narrow supports shown here

of the pier fenders showed that during the past 8 years a 6 to 12-in. growth of barnacles had become encrusted on the fender sections, causing several of them to pull out under the added weight, estimated at 50 tons a section. On this basis, the fenders of each pier are carrying a load of 580 tons of healthy marine growth. As concrete is impervious to any harmful effects from this growth it is presumed that the piers proper will suffer no impairment or damage.

The Equipment Used

Working equipment on pier reconstruction included a 2 cu. yd. portable Mixermobile concrete mixer, a Lima power crane for handling materials and a Le Roi 315 Airmaster portable compressor with a portable welder for welding operations. A tug boat and barge were used to move equipment and materials from one pier to another.

Reconstruction of the east and west anchorages and the six piers and four bents for supporting the new bridge and viaduct approaches has been under way since April, 1948, with first placement of concrete about Sept. 15.

Detailed shop plans for the first 8 tiers of each of the towers have been submitted for approval by engineers and found acceptable. The towers are being fabricated at Pottstown, Pa., and first steel is expected to arrive by mid-December.

First step by the subcontractors was to excavate around the anchor blocks to their base and then by carefully planned dynamite demolition remove 11 ft. depth of old concrete from each side of the two huge anchor blocks, one on either shore side of the Narrows. The base block to which the cables are attached through I-beams, had to be extended 8 ft. on each side and 20 ft. to the rear in order to meet the greater separation distance between the cables—60 ft. in the new span as compared with 39 ft. for the old bridge.

About 6,000 cu. yd. of concrete was blown off the anchorages and approximately 12,000 cu. yd. added. Total size of each anchorage is being increased from 20,000 to 26,000 cu. yd. to withstand the pull of the heavier bridge. The new concrete anchors will measure 110 ft. long, 90 ft. wide and 50 ft. thick. Each anchorage will withstand a pull of 18,000 tons. The new anchor bars will be placed farther back in the new block and tied into a solid 20-foot thick addition of concrete to the rear of the old anchor blocks.

The Bethlehem Pacific Coast Steel Co. is now revamping the old west approach to the bridge which must be jacked up approximately 24 in. at pier 3. Fourteen jacks will be used to raise the 435-ton weight and the job is expected to require 3 months. The old viaduct approach on the west side was left intact by the collapse of the bridge and will be used for the new span with some enlargement and strengthening.

Construction Time Table

Mr. Andrew estimates that construction of the towers will require 3 months, after which spinning of the big cables will consume about 4 months; some 2 or 3 months for constructing the big stiffening trusses and about 3 months more for constructing roadbed, sidewalks, railings and lighting. As near as can be determined now the bridge will be completed by April 1, 1950, barring unforeseen delays in deliveries of steel.

Working equipment employed on shore sides included another Lima power crane equipped with a ¾ yd. Amsco clamshell bucket for excavation work around anchorages and bents; also a Chicago 210 PG-40 air compressor for drilling and breaking up concrete. A mobile tractor Multi-Foote paver, model 27-E, of 2 cu. yd. capacity was used for mixing concrete poured into a 3-bowl turntable concrete carrier of 3½ yd. capacity, mounted on skids. A D-4 Caterpillar bulldozer was employed for earth moving operations.

Personnel on the project includes Eugene Peterson as general foreman for Woodworth & Co., with Earl Starbard and Gerald Keely serving as superintendents in charge of pier and anchor block reconstruction. Tom Martinson is resident engineer for Bethlehem Pacific Coast Steel Corp. and Kenneth Arkin serves as Chief Inspector for Washington State.

★ Work in progress on tower of west approach

Highway Research Board Meeting

(*Continued from page* 46)

determine what axle loading and vehicle size maximums should prevail nationally—to decide what combination of highway costs and commercial operating costs will put transportation costs at the lowest.

This pilot study marks the beginning of exploration into broader phases of highway use economics. Plans are afoot to expand the study to other classes of vehicles than heavy trucks, and to make case studies of such subjects as the cost of pick-up-and-delivery service vs. through hauling in various localities. A final phase will be a cost study of highway service at various levels of geometric road design, in terms of various gross weight brackets.

●

New York City's state-aided grade crossing elimination program is nearing completion, according to coordinator Robert Moses, with 80 projects finished in 1939-43 at $40,538,000. Two major and seven minor projects remain.

★ Demolition of pedestal on pier No. 4, and view of pier 5 showing remaining grillage after cutting down old pedestal to base level

★ **BEFORE AND AFTER.** Looking along a business street in Colorado Springs, showing typical rough, worn pavement, contrasted with smooth-riding resurface now being enjoyed

City-Wide Street Program Performed Under

Management Contract

Over 700,000 sq. yd. of hot-mix applied on 52% of arterial street mileage. Novel arrangement with Gibbons and Reed, contractors, enabled city to utilize new city-owned equipment and get the benefits of experienced contractor management

By Howard J. Arnberg

Special Correspondent to Roads and Streets

THE "golden streets" of Colorado Springs, Colorado, are more than just a boast of the city fathers, following a 1948 street department program in which 52% of the city's arteries were resurfaced or seal-coated. The year's work covered 99 miles of street, with an outlay of $493,000, 47½ miles being given an asphaltic concrete resurface.

The reference to "golden streets" is literal, too, in that the hot-mix for the 47½ miles contained crushed rock from a mill dump in the famous gold mine area of Cripple Creek.

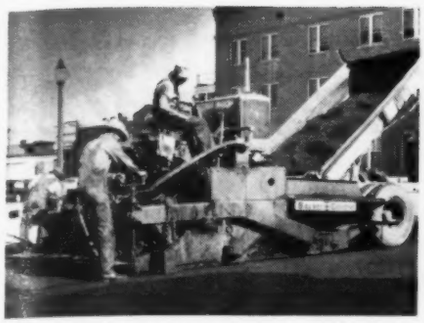
Streets in the business section were included in the program. These had not been touched, other than for frequent patching, since paving was laid in 1911 and 1912. The City Council, realizing the impression made on tourists by the craters and waves in the pavement, issued a go-ahead order to city manager C. H. Hoper. James J. Murray, newly appointed street superintendent, found he was starting from scratch.

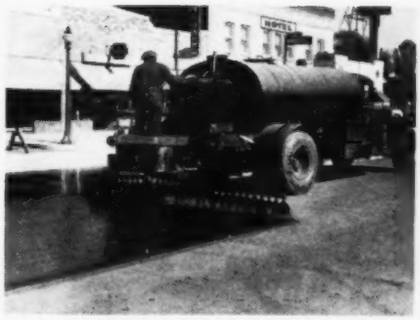
Equipment on Hand

On hand in the city's equipment fleet for use in a possible street program were two Ford coupes, six pickup trucks, fourteen 1½-ton trucks, three stake body trucks, one small type Huber motor grader, one Austin-Western motor grader, a No. 11 and a No. 12 Caterpillar, a Galion portable roller, a D4 Caterpillar bulldozer, a rock crusher of rather ancient make, one rubber-tired roller, one South Bend 1,000-gal. distributor, and a power broom. That was all the equipment on hand with the exception of two loaders, a ⅓-yd. Lull and an Athey conveyor.

With future street maintenance needs in mind the city made the following purchases: a 3,000-lb. Madsen hot-mix plant, complete with 8,000-gal. working tank and two 10,000-gal. stor-

★ Planer used by Gibbons and Reed, contractors, consisted of a motor grader with heater unit mounted under the frame





★ Some of the city equipment, newly purchased or already owned, which was utilized in the 1948 street repair program. Paver: Barber-Greene. Distributor: South Bend 1,000 gal. Spreader: Apsco. Roller: Galion

age tanks; a Barber-Greene paver; two Buffalo-Springfield rollers (10 to 12 tons); five 1½-ton dump trucks; two pickup trucks; one 1-yd. Hough loader; one power broom; and one chip spreader. Total cost, $128,500. Hand tools and lighter equipment were also purchased.

This equipment was augmented by the following units which were "borrowed" from other city departments or leased for the duration of the 1948 program: One TD18 and two TD14 International tractors and dozers; one 1,000-gal. distributor; one 10 to 12-ton roller and from 6 to 30 dump trucks, the latter figure varying with the demands of the project.

Contract Details Unusual

The program in general was based on a resurfacing with asphaltic concrete to 1½-in. minimum depth, preceded by planing of surface to approximate level. In order to facilitate the project the planing phase was executed on a contract basis with Gibbons and Reed of Salt Lake City, Utah.

Using its pre-heating process with a heater mounted on a heavy motor grader, the contractor planed 166,484 sq. yd. at a price of $24,143. This figure is based on the first 100,000 sq. yd. at 15.5 cents, and additional yardage (66,484 yd.) at 13 cents.

City officials recognized that a project of this magnitude would entail experienced supervision, and again contracted with Gibbons and Reed. A managerial and training contract was executed whereby the Salt Lake City firm supplied a general superintendent, a hot-mix plant foreman and a street foreman on an initial basis of 4% of the cost expended.

The total cost on the 1948 program was broken down as follows:

Planing	$ 24,142.92
Processing (hot-mix plant, labor, material)	334,558.45
Laying (tack oil, labor, equipment)	73,026.82
Seal Coating (material, labor, equipment)	61,285.21
	$493,013.40

Amortization on equipment included in the cost of the project was based on the accepted formulas as outlined by the Associated Equipment Distributors in the publication "Compilation of Rental Rates for Construction Equipment."

Good weather aided in pushing the project through to an extent not originally anticipated in planning the year's work. Actual paving started on June 14. In the following 119 possible working days, crews, which at peak numbered 141 men, worked 114 days. They could have worked at least two other days, but crushed rock failed to arrive.

The gold-bearing crushed rock was obtained on contract at $3 per ton delivered at the hot-mix plant. It was transported the 42 miles from Cripple Creek over the Midland Terminal narrow-gauge railroad. Fine sand used in the aggregate was obtained from a city-owned mill dump, at 50 cents per ton. Chips for seal coating were obtained from Pueblo; cost including freight $2.74 per ton.

The asphaltic cement was obtained from the Ohio Oil Company's Zube, Wyoming, plant at $26.90 per ton including freight. RC-3 road oil used in the "tacking" prior to laying the top-

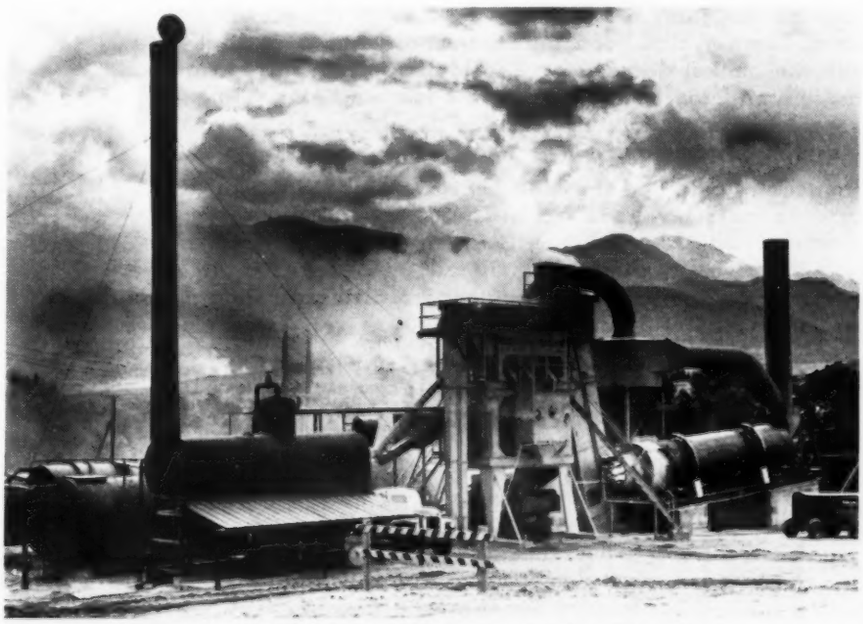
ping came to 12 cents a gallon, delivered.

Entailed in the project were several lengthy strips where the base was in such condition that its removal was necessitated. The project on entire block areas and on spots throughout the city involved removal of 15,985 cu. yd. of old material. In building up the new base 18,100 cu. yd. of gravel was hauled.

A Few Figures

Interesting economies achieved as the program progressed were highlighted in the processing cost at the hot-mix plant. During the first month of operations a production cost of $10.16 per ton was recorded, although

(*Continued on page* 90)



★ The new hot-mix plant (Madsen) set up by the city for the 1948 work and for future street maintenance

Here's the way to cut costs on jobs like this!

IT'S THE MULTIFOOTE HIGHLIFT BOOM

YOU remember only too well how a job like this used to be handled. It meant a small mixer, small capacity, perhaps shooting towers or lots of concrete buggy work, perhaps a crane and lots of false construction.

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Your MultiFoote and the MultiFoote Elevated Boom means new versatility both on highway work and general concrete construction. Let us give you complete details. Two sizes: 34-E Single Drum and 34-E Duomix (double drum). Remember there are more MultiFoote Pavers in service than any other make.

MultiFoote Duomix doing a job for R. R. Anderson on Chicago's 31st Street.

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Highways Can Be Tailor-Made

By Using Adequate and Accurate Data

A general article entitled "Highways are Tailor-Made in Kansas" appeared in July, 1948, ROADS AND STREETS. *In view of the good reception of this article and inquiries regarding the details of design and the request to give specific examples of the character of some of the various types of construction described in that article, the author presents the first in a series of articles to satisfy those demands*

By W. J. Arndt
Assistant Engineer of Materials
State Highway Commission of Kansas,
Topeka

THE general article describing the system by which it is possible to "tailor-make" highways in Kansas was described as—"a close approach to a pure scientific method of design." Further information revealed that it is a triaxial system of measuring the strength of soils, stabilized mixtures of soils and aggregates, crushed stones, and bituminous mixtures. The strength of these mixtures is determined by finding the stress-strain relationship of a compacted column of the material to which is provided a moderate amount of lateral support.

Design Formula Used

These stress-strain data, together with other substantiated data, are used in the following formula to give a balanced design thickness for any flexible traffic supporting layer:

$$T = \left[\sqrt{\left[\frac{3Pmn}{2\pi CS}\right]^2 - a^2}\right]\left[\sqrt[3]{\frac{C}{C_p}}\right]$$

In order to fully appreciate and understand the factors and considerations which are necessary to accurately "tailor-make" a traffic-supporting layer or layers, it is better to first review these various factors and their sources.

"T" is the total thickness required of any single mixture whose strength has been measured and expressed as "C_p", over a soil or subgrade whose strength has been measured as "C".

"C", the modulus of deformation of the subgrade and "C_p", the modulus of deformation of the mixture or stabilized layers are determined by evaluating the secant modulus from their stress-strain curve.

"P" is the base wheel load which, for the present laws in the State of Kansas, is 9,000 lb. since the State law limits axle loads to 18,000 lb.

"M", the traffic coefficient, is indicated in the following Table No. 1.

Table No. 1

Traffic Coefficient	Wheel Load	Total Traffic
m	*Pm* lb.	*veh per day*
1	9,000	1,500-up
5/6	7,500	900-1,500
2/3	6,000	300- 900
1/2	4,500	50- 300

This particular table indicates the simplicity with which adequate surfaces can be designed for roads having various traffic characteristics.

"N" is the saturation coefficient based on rainfall and its numerical value is given in Table No. 2.

Table No. 2

Saturation Coefficient	Average Annual Rainfall
n	*in.*
1.0	35.0—45.0
0.9	30.0—34.9
0.8	25.0—29.9
0.7	20.0—24.9
0.6	15.0—19.9

In view of the wide variation of rainfall in Kansas, it is necessary to use a variable coefficient of this nature because of the fact that all samples are saturated for testing purposes.

"a", the radius of area of tire contact, depends upon the wheel load which is used and is shown in Table No. 3.

"S", the permitted deflection of the surface is valued at 0.1 in. for the flexible pavements used in Kansas.

The above outline of the formula and values used will permit a more ready understanding of the basic factors considered in the design of each of the following projects.

Examples of Design

In order to demonstrate more fully the exactness with which the triaxial system of design enables Kansas engineers to adequately yet economically design and construct flexible bases and surfaces, two actual projects which have been built will be described in detail.

All of the types discussed in July, 1948, ROADS AND STREETS will not be exemplified since space would not permit this.

These project descriptions, however, show how it is possible to design and build flexible bases and surfaces in essentially the same manner as bridges or other structures are designed, i.e., when the strength of the various materials are known and when the stresses to be placed on these materials are known, then the structure can be built which will adequately support the forces imposed on it. The

★ Parallel windrows of sand and pulverized subgrade for modified subgrade Project 544 (7) or "Project II"

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DOUBLE CURVED CUTTING EDGE — Boils dirt into apron uniformly with reduced horsepower requirements.

POSITIVE ROLLING EJECTION — Full clean dump — FAST.

LOW MAIN FRAME — Provides low center of gravity, greater stability.

STRAIGHT LINE CABLE REEVING — No side bends — only one reverse bend.

STRUCK CAPACITIES

S-46	4 cu. yd.
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ALSO B-TYPE SCRAPERS in these Struck Capacities

B-170	15 cu. yd.
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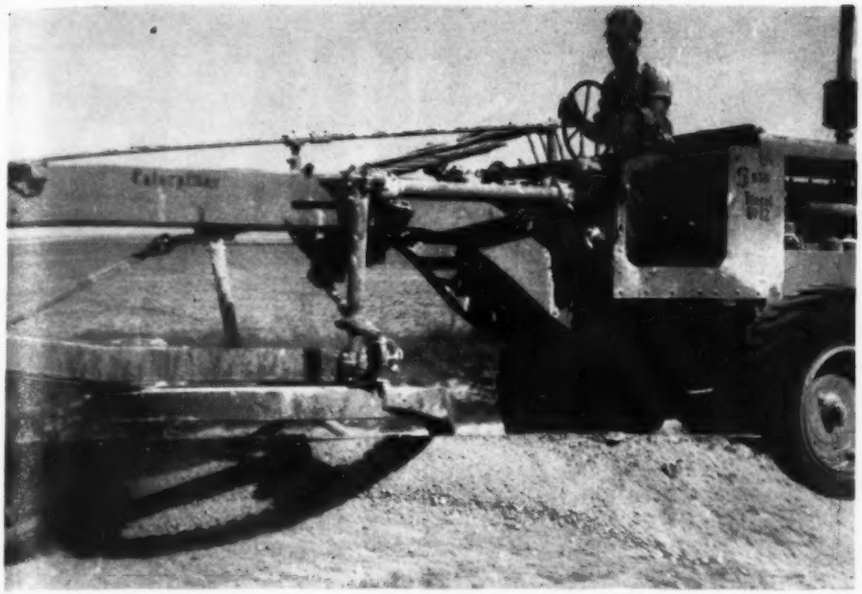

★ San Ore Construction Co. mixing modified subgrade Project 544 (7)

road surface problem has been much more complex due to the variable nature of the subgrades, and due to costs it is not possible to use a highly adequate "factor of safety." For this reason, this method, in which all factors can be considered and translated into a working system on an economical yet substantial basis, is highly important for study by all engineers.

These project descriptions shall include the basic design, costs and construction methods. Each of these projects has been completed.

Project No. I is a typical project design in the eastern part of Kansas in which the soils, rainfall and traffic are each greater than those in the western part of the state. The second project was constructed in the western part of Kansas. Take careful cognizance of the basic difference between the two types of projects. Both are adequate for their particular conditions. By accurately determining and using each of the important factors bearing on the project under consideration, great economies are possible. Each structure is adequate and substantial enough to satisfy its traffic for many years ahead.

PROJECT NO. I

US-54—104 FAGH 367 D (1)—
Woodson County, Kansas
US-54—1 FAGH 367 F (1)—
Allen County, Kansas

Location: On US-54 beginning 3 miles south of Piqua, Kansas, extending northeast 4 miles. The terrain is flat and the alignment runs parallel to the Missouri Pacific Railroad. The traffic volume on this location is 1800 vehicles per day, which calls for a traffic coefficient of 1.0 (Table No. 1) and the average rainfall in this area is 38" per year which calls for a saturation coefficient of 1.0 (Table No. 2).

Design: Due to the ready availability of limestone and to the past success of this type of base course, it was determined beforehand that the design would be based on this type having the following characteristics:

Type AB-3 (Predominately Limestone)—The combined material for this grading shall consist of 90% or more of material produced by the mechanical crushing of limestone. The grading and plasticity shall be as follows:

Retained on 2-in. sieve	0%
Retained on 1½-in. sieve	0 to 5%
Retained on ¾-in. sieve	5 to 30%
Retained on No. 4 sieve	35 to 60%
Retained on No. 10 sieve	45 to 70%
Retained on No. 40 sieve	60 to 84%
Retained on No. 200 sieve	80 to 92%
Plasticity Index	1-6*
Liquid Limit, not more than	25*
Modulus of Deformation, C_p	10,000

The fraction passing the No. 200 sieve shall not be greater than ¾ of the fraction passing the No. 40 sieve.

*Note: This range applies when tests are being conducted under AASHO T89, T90 and T91. When being tested under the "wash method" this range for plasticity Index shall be from 2 to 8 and the Liquid Limit shall not exceed 30.

The wearing course was to be an asphaltic concrete having the following characteristics:

Type HM-7 (Chat Aggregates). The aggregates used to make this grading shall be mine tailings from the lead and zinc ore industry of southeast Kansas, commonly known as chats. The mineral filler may be limestone dust. The grading shall be as follows:

Retained on ¾-in. sieve	0%
Retained on No. 8 sieve	30 to 60%
Retained on No. 30 sieve	65 to 80%
Retained on No. 200 sieve	83 to 88%††
Bitumen content, percent by weight of dry aggregate	5.5 to 9
Modulus of Deformation, C_p	25,000

††Note: These limits shall be changed to 87 to 92 percent if asphaltic cement of a grade 60 to 70 penetration or harder is required. If this grading is to be used on slopes of greater than 3.0 percent grade the mineral filler shall be either chat sludge or limestone dust and the amount shall be 10 to 15 percent passing the No. 200 sieve in the final mix, regardless of the penetration grade of asphalt.

Based on these facts the soil survey party procured 25 undisturbed samples from the existing subgrade at this location. The grade had just been completed under a recent project and was rolled to 90% of standard compaction (AASHO). The undisturbed samples procured were taken to the laboratory. Here the characteristics of each soil material were accurately evaluated and strength determinations (stress-strain measurement) obtained for each of the 25 undisturbed samples from the existing subgrade.

The following Table No. 4 gives the soils characteristics and in addition gives the modulus value "C" obtained from the triaxial test.

Only a few of the typical soils are given and they represent at least one typical soil in each of the sections in which there was a change in thickness.

The thicknesses of crushed limestone base course Type AB-3 were based on the use of a 3-in. thickness of asphaltic concrete. The modulus value of C_p for the asphaltic concrete was 25,000. The modulus value for the crushed limestone base material was 10,000. These values are, at the present time, standard for the respective type of mixture. They were arrived at through numerous tests of each type of mixture and through oc-

Table No. 3

Traffic Coefficient	Dual Wheel Load	Single Tire Load	Tire & Rim Assoc. 1940 HRB p. 269 Size Tire	Space c to c	Contact Area[a]	Radius of Contact	Average Unit Pressure
m	*Pm* lb	½ *Pm* lb		*b* in.	*A* sq. in.	*a* in.	*p* psi
1	9,000	4,500	9.75x20 10.50x22	13	54	4.15	83.33
5/6	7,500	3,750	9.75x20	12	50	3.99	75.00
2/3	6,000	3,000	9.00x20	11	45	3.78	66.67
1/2	4,500	2,250	8.25x22 7.50x20	10	39	3.52	57.69

Table No. 4

Test	Station	LL	PI	Class	%S	%C	Std. Comp.	Opt. Mois.	Density	Moisture	Modulus	Thickness
8250	500	41	23	SiC	7	39	103	19	96	26	2000	8.1
8256	545	54	36	C	6	49	93	23	84	34	1540	12.5
	568	41	23	SiC	7	39	103	19	96	26	2000	8.1
8373	585		34	C	8	54	96	27	95	26	1580	11.0
8376	660		39	C	8	52	97	21	90	30	1140	15.0
8266	35	37	17	SiC	7	43	101	21	97	24	1380	11.0

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casional check tests from time to time these values are maintained. For this project, the variation in the crushed limestone base course thickness for the length of the project was as follows:

Sta.	to Sta.	Base Thickness	Total Surf. Thickness (incl. 1½" Binder)
495	542	8"	3"
542	552	10"	3"
552	572	8"	3"
572	627	11"	3"
627	661	15"	3"
1+08	8+00	15"	3"
8+00	60+02	11"	3"

Scanning this table and comparing it with Table No. 4, it can be seen how the variation in soil types and the variation in soil density affects the required thickness in base course; where the soils were heavier or had inadequate density, the thicknesses were heavier. Where the soils were better the base thickness, of course, was less. This is a very good demonstration as to the term "tailor-making" highways. The fuller meaning of this expression, however, will be realized when one reads the description of Project No. II which is built in an entirely different area and under different traffic conditions. Project No. II will be described farther on.

Project No. I was awarded May 26, 1948, to the Kaw Paving Company at Topeka, Kansas, under the quantities and costs shown in the tables.

Construction Details

The contractor located an excellent limestone quarry about two miles south of the project and set up there with a Cedar Rapids crusher unit which had a capacity of 100 tons per hour of base material having characteristics as tabulated.

The base course aggregate was crushed and stockpiled by the Concrete Materials and Construction Company of Cedar Rapids, Iowa; then hauled to the project, windrowed, spread and compacted to produce a 4-inch lift. Compaction was accomplished with two pneumatic rollers and finally with an 8-ton flat face roller. The finished thicknesses for the various subgrade conditions were obtained and the base left to dry and cure before any prime oil was distributed. The base course when completed was very hard and dense.

★ Concrete Materials & Construction Co. finishing crushed rock base on FAGH 367 D (1) Kaw Paving Co., Topeka, Kansas, Prime Contractor

Due to the high density in the base course the prime coat of MC-1 was reduced from a planned 0.5 gal. per square yard to 0.35 gallons and even this penetrated very slowly.

The sheet asphaltic concrete surface course was laid in two 1½" compacted courses, a binder grading and a surface grading.

The gradings of these two courses were as follows:

Binder Course (HM-3)—All sieves square mesh

	¾"	⅜"	#4	#8	#16	#30	#50	#100	#200
Retained on									
Percent	0	2	19	48	61	74	83	89	94

% Asphalt (70-85)—6.4 Density Compacted Binder Course—2.14

Surface Course (HM-7)

	¾"	⅜"	#4	#8	#16	#30	#50	#100	#200
Retained on									
Percent	0	1	18	44	59	71	79	85	88

% Asphalt (70-85)—8.0 Density Compacted Surface Course—2.18

These aggregates are 100% crushed flint aggregates.

The Kaw Paving Company of Topeka, Kansas, mixed these materials with a 125-ton per hour Simplicity batch plant. The mixture was spread and finished with a Barber-Greene lay-down machine. Rolling was performed by an 8-ton tandem roller.

The project is under traffic at the present time and is an excellent example of tailor-making adequate yet economical road surfaces in Kansas.

PROJECT NO. II

US-270—34 F 544 (7)—Grant County, Kansas

Location: On US-270 beginning at the north Grant County Line extending south 10 miles. This country is flat and in semi-arid climate. Being in western Kansas, which is not so heavily populated, the traffic count over this location is 275 vehicles per 24 hours. Such a traffic count permits the use of a traffic coefficient of ½ and since the average annual rainfall is 17.2 in., a rainfall coefficient of 0.6 was used.

The soils in this region are better than those over Project No. I as will be revealed from the table of soil tests.

In view of these factors, less traffic, less rainfall, and better soils it is possible to design a wholly adequate yet very economical base for the bituminous surface. The design which will be shown has the same degree of permanency for this location as the design shown for Project No. I.

Design: Due to the ready availability of dry sand pits in this area, Kansas has developed a type of base construction which embodies adding sufficient granular materials to the existing subgrade soils until the desired strength is reached. This is called "Modified Subgrades."

For better soils, on a given location, less sand, perhaps 30%, is sufficient while on the poorer soils it may require as much as 60 or 70%. Compacted

Base Course

Item	Quantity	Unit	Unit Price	Amount
Crushed Stone	37,034.00	Tons	$ 1.61	$59,624.74
Manipulation & Laying	219.94	Sta.	29.80	6,554.21
Water	2,480.0	M Gal.	0.75	1,860.00
Total Base Cost				$68,038.95

All Sieves Square Mesh

Retained on	1½	¾	⅜	4	10	40	100	200	Liq. Limit	Plast. Index	Optimum Moist.	Maximum Wt/Cu.Ft.
Percent	0	6	22	44	64	83	89	90	18	5	8%	139

Sheet Asphalt Surface Course

Item	Quantity	Unit	Unit Price	Amount
Aggregate for Binder Course (HM-3)	4,160	Tons	$4.98	$ 20,716.80
Aggregate for Surface Course (HM-7)	4,450	Tons	5.11	22,739.50
Asphalt Cement (70-85 Penet.)	149,400	Gal.	0.115	17,181.01
Cutback Asphalt (MC-1) for Prime	27,370	Gal.	1.12	3,284.40
Total Surface Cost				$ 63,921.71
TOTAL COST				$131,960.66

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mixes are made using various percentages of the local sands until the proportion which produces the required strength, the required "C" for the underlying soil. Increased strength is attained by giving the soil a better grading and at the same time reducing its plasticity. Over this reinforced subgrade a suitable wearing course is constructed.

Table No. 5 shows the characteristics of the existing unmodified soils. (Only a few of those tested are shown.)

Construction Details

The aggregates for the purpose of modifying the subgrade and for the bituminous mat wearing course were all obtained locally.

The existing subgrade had been previously treated. Work was started on May 3, 1948, by scarifying the existing road to the proper depth. After the scarification process, sheepsfoot rollers and a Seaman Tiller were used for pulverizing the scarified material. Pulverization was carried to meet the following requirements:

Passing ¾-inch sieve.....100%
Passing No. 4 mesh sieve, not less than..... 70%

The subgrade soil and existing light bituminous surface were windrowed after pulverizing, then the aggregate for modifying the soil was windrowed along side of it. The aggregates and soil were dry mixed first, then water was added to complete the mixture. This mixture was then spread and compacted with sheepsfoot and pneumatic rollers to 100% of Standard Compaction (AASHO).

The thicknesses and proportions for the various sections were attained as called for in the original design previously indicated.

Many of our readers may wonder about the formula on which the Kansas Flexible road design procedure is based. Since the complex nature of this formula precludes a brief explanation that is wholly satisfactory, Mr. Arndt plans to devote a separate article to the formula and the judgment factors back of it.— **Editor.**

Table No. 5

Test	Station	LL	PI	Class	%S	%C	Std. Comp.	Opt. Moist.	Density	Moisture	Modulus
503	98+00	33	16	Clay loam	30	23			101	22	1670
522	176+00	32	16	Loam	40	19			99	14	1650
505	56+00	35	19	Clay loam	26	24	102	19	99	23	1085
510	394+00	52	31	Clay	16	51	91	26	90	20	940

Table No. 6

Test No.	Soil No. Modified	% Sand	Modified Std. Density	Modified Opt. Moisture	Modulus of Modified Mixture
505M-50	505	50%	116	13	1680
510M-70	510	70%	116	13	1325

Table No. 6 shows the results of adding local pit sands with the existing subgrade soils and their increased modulus.

The local pit sand used for modifying these subgrades was graded as follows:

Retained on Square Mesh Sieve Size	Percent
⅜ in.	0
No. 4	0
No. 8	7
No. 16	24
No. 30	59
No. 50	86
No. 100	93
P.I.	1

From these data then the final satisfactory design for this ten-mile project was as tabulated.

This project was awarded on March 23, 1948, to the San-Ore Construction Company of McPherson, Kansas, under the quantities and costs shown.

Comparison of Conditions and Design for Both Projects

Project Number &	County	Part of Kansas	Annual Rainfall	Daily Traffic	Soils Type	Soils P.I.	Soils "C"	Design Thickness Base	Design Thickness Wearing Course	Cost per Mile
FAGH 367 D (1)	Woodson	Eastern	38"	1800	Clay	34 to 39	1140 to 1580	Crushed Stone 11" to 15"	3"	
FAGH 367 F (1)	Allen	Eastern	38"	1800	Silt-Clay	17 to 23	1380 to 2000	8" to 11"	3"	
										$32,990.00
F 544 (7)	Grant	Western	17"	275	Loam	16	1670	40% sand at 4"	2"	
					Clay	31	940	70% sand at 7"	3½"	
										$ 9,559.00

Station to Station		% Sand	% Existing Subgrade Soil	Depth Modified	Thickness Bit. Wearing Course
55+00	125+00	40	60	6"	2"
125+00	184+00	40	60	4"	2"
184+00	282+00	40	60	6"	2"
282+00	343+00	—	—		2"
343+00	410+00	70	30	6"	3½"
410+00	425+40	40	60	4"	2"
0+00	158+58.6	40	60	4"	2"

Modified Subgrade

Item	Quantity	Unit	Unit Price	Amount
Aggregate for Modifying Subgrade	14,795	Tons	$ 1.10	$16,274.50
Water	1,640	M. Gals.	1.00	1,640.00
Manipulation for Subgrade Modification	468.09	Stas.	22.00	10,297.98
Total for Base				$28,212.48

Bituminous Mat Wearing Course

Item	Quantity	Unit	Unit Price	Amount
Cutback Asphalt (MC-1) for Prime	83,527	Gals.	$ 0.13	$10,858.51
Asphaltic Road Oil (SC-4) for Bit. Mat	179,373	Gals.	0.12	21,524.76
Aggregate (BMA-1 or 2)	15,572	Tons	1.50	23,358.00
Manipulation for Bituminous Mat W.C.	529.09	Sta.	22.00	11,639.98
Total for Surface				$67,381.25
TOTAL COST				$95,593.73

Densities in the subgrade were increased from 100 lb. per cu. ft. to about 124 lb. per cu. ft. over most of these modified areas while the plasticity indices were reduced from about 20 to between 5 and 7.

The modified subgrade was left to dry and cure for several days then primed at 0.35 gal. per sq. yd.

The aggregates for the bituminous wearing course were then distributed at the rate to provide the proper thickness.

The aggregates and SC-4 asphaltic oil were mixed through a Barber-Greene traveling plant consisting of an 82A loader and an 848 heavy duty mixer. Mixing of the entire ten miles was completed in 16 days. Very little additional blade mixing was necessary. The bituminous wearing course was laid and compacted with pneumatic and steel drum rollers. The project has been open to traffic for some time now. This project exemplifies the pos-

(*Continued on page* 90)

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BRANCHES AND DEALERS IN PRINCIPAL CITIES

Airport Runway Base Construction

(*Continued from page* 62)

based on the weight of the graded mineral aggregate.

A equals the percent of the mineral aggregate retained on a No. 10 sieve.

B equals the percent of mineral aggregate passing a No. 10 sieve and retained on a No. 200 sieve.

C equals the percent of the mineral aggregate passing a No. 200 sieve.

Factor K is derived by past experience in paving and gives a definite control, both on variations of percent asphalt contained in an emulsion and the type of aggregate used. The values for "K" should vary between 55 and 65—55 being used for a hard, silicious, non-absorptive aggregate; 65 being used for soft, porous, absorptive limestones.

Frequent Screen Tests

Screen analysis was made in the field laboratory as often as was found necessary to determine the gradation of the sand. Also, the untreated stability of the sand was carefully checked by the method suggested by the Florida state road department bulletin, entitled, "Sand Bituminous Road Mix Pavements."

Time and space will not allow for full discussion of the Florida Bearing Value Test, but this information is available in the brochure mentioned above. A machine for conducting this test was in use in the job laboratory, in order to determine the quantity of fines to be mixed into the hydraulically placed base course to produce satisfactory bearing value. The fines of the borrow pit were carried away with the effluent, leaving little 200-mesh material.

The following is a typical analysis of a blend of the dredge sand and silty soil:

Percent Passing	
Sieve	Percent
¼"	100
No. 10	99
40	80
80	25
200	9

This sample, when tested in accordance with the stability method specified for untreated sand, gave a result of 46 pounds per square inch, which was well in excess of specification requirements. Also, after this material was mixed on the runway and the laboratory stability determined on a compacted specimen at 140° F., the bearing value was found to be approximately 160 psi., when tested by the Modified Florida Sand Stability Method. The field laboratory also made continuous follow-up checks on residual asphalt and gradation of aggregates after mixing. The residual asphaltic content varied from 5.25% to 6.5%.

Rain Hampered Work

The contractor started to mix the base course on October 26, 1942. The first plane landed on completed pavement on Christmas Day, 1942, but the project was not completed until August, 1943; most paving by late spring, 1943. During the months when the major part of the base course was completed, there was an average of eight days of heavy rainfall each month, and in addition, there were many days when frequent showers occurred. Moisture in the freshly dredged sand plus that added by the frequent showers and many heavy rains resulted in the sand being damp at all times, and in many instances completely saturated when the silt, sand, and emulsified asphalt were mixed. No effort was made to aerate or dry the sand previous to the mixing operation. When rain occurred during mixing, drying, or spreading, work was stopped until excess rainwater drained off. Dehydration of the mixture ceased and no adverse effects were noted when operations were resumed. Also, December through March, 1942, the average temperature was in the range of 52 to 58° F.

This was certainly not favorable weather for this type of construction, but notwithstanding the adverse weather, the construction operations were carried on in accordance with the U. S. Engineers schedule.

The following equipment was used for the base construction:

1 Flynn road builder
4 Adams No. 50 road graders (19,000 lb.)
2 Pneumatic tired rollers (one 11 wheel and one 13 wheel)
2 Heavy-duty disc harrows
3 Tractors (one 60 hp) (one 40 hp) (one 20 hp)
7 Trucks equipped with 1,000 gal. supply tanks
1 ¾ C. Y. dragline (to load silty admixture)
6 Two-ton trucks (to haul admixture)

The sequence of operations was as follows:

1. Bring runways and taxiways to grade and cross-section with power graders.

2. Apply about 1 in. of fine silt to dredged sand.

3. Mix emulsified asphalt, sand, and silt with Flynn road builder. Emulsified asphalt at 7.5 gal. per sq. yd. for the 8-in. base.

4. The mix was allowed to partially dehydrate before further manipulation. During favorable weather, the dehydration period was usually about 24 hours. Very often, when water content was extremely high, the mixture was aerated by tracking through it with crawler tractors. Discs under these conditions, tended to return mixture to a flat condition, offering less surface for evaporation.

5. Disc harrows were used to reduce the moisture content of the mixture to about 5%.

6. Blade the mixture into three or more windrows, for the 150-ft. runways.

7. Spread the mixed material in successive 2-in. layers. Compact with pneumatic tired rollers. Rolling carried on simultaneously with the blading. After the areas were compacted between windrows, the remainder of the windrow was moved, the subgrade compacted, and the remaining mixed material bladed back and compacted in 2-in. layers.

8. Grade stakes were set and any necessary corrections made in the finished surface by blading, or scarifying, reshaping, and compacting, if required.

500 Sq. Yd. per Hour

The road builders mixed the base material to the full depth of 8 in. for a width of 12 ft., and traveled at 14 lin. ft. per min. This machine, crawler mounted, was essentially a travelling pug-mill mixer, the blades of which were set to mix the material to the desired depth. The average rate of mixing and compacting was 5,000 sq. yd. per 10-hr. day. The maximum gallonage mixed in one 12-hour day was 93,000. Although the specifications provided for the addition of water to provide for proper dispersion of the emulsified asphalt, it was found that additional moisture was not required. Minute examination indicated that the particles were completely coated with the asphaltic material, and no "balling" of aggregates was evident.

During base course operations, as often as a section was brought to final grade, it was put into use as a raceway for the fleet of self-powered scrapers being used in grading operations, also for trucks hauling excavated material, pipe, concrete, etc. This usage was often premature by many standards, but added materially to the speed with which compaction was secured.

The first 5,000 ft. of base was put in operation without the wearing surface, to meet emergency needs. Planes up to 58,000 lb. began to use this base as completed, and placing of wearing surface was planned so as not to block more than one runway at the time. The emulsified asphalt base stood all loads imposed without benefit of wearing surface, showing only a slight abrasion at points where tires skidded on landing contact. Although planned for use by 60,000 lb. airplanes, the field was taken over shortly after completion by the Third Air Force, which used in great numbers the B-29 Aircraft, weighing approximately 107,000 lb. The training program included "Touch and Go" flying, night and day, for many months. As far as is known by the writer, no base failures ever occurred, other than where a few muck-

(*Continued on page* 90)

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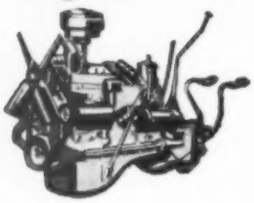

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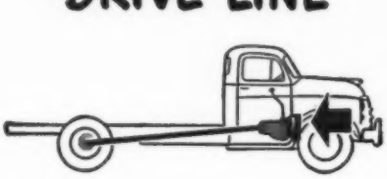

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"Economy" Bridges

A Widespread Need for Secondaries

REPLACEMENT of numerous small bridges of the horse-and-buggy era with modern structures has become an important feature in the secondary road program in a number of states, and highway engineers are giving much thought to the problems involved in their construction. This is particularly true since the federal highway program now includes funds for secondary roads. One of the Public Roads Administration's requirements is that, in order to qualify for this financial assistance, the roadway on such bridges must be no less than 4 ft. wider than the pavement approaching the bridge.

In some cases an existing bridge may be widened to come up to the requirements. Most frequently, however, this is not possible, due to the fact that the additional deadweight would be too great for the foundations, particularly in view of the increasing live loads in today's highway traffic.

The need for economy of construction has led many highway engineers to make careful studies of the design for secondary bridges. One of the most promising solutions so far developed is an all steel-and-concrete bridge with standard H-piles serving as foundations and piers, and with a roadway consisting of a simple I-beam span on which is laid a reinforced concrete floor. Standard steel guard rail posts and beam guard rails make up the hub guard and hand rail.

A number of bridges of this design have already been completed in Georgia, Ohio, New Jersey, North Carolina, Texas, Vermont and other states, both on state and county roads. The Bethlehem safety beam guard rail has been found very popular in this type of construction, due to its attractive appearance and the ease and economies offered in erection. Details of this rail, showing methods of installation and attachment to the roadway are shown in Fig. 1. Where a curb is desired, this can be easily installed by means of the combination guard rail and curb shown in Fig. 2. This curb, made up of two 10 gauge steel sheets, presents a light and strong construction.

As an example of the economy offered in an installation of this type it may be pointed out that one of these bridges, with a 22-ft. roadway, was completed at a cost of $93 per running foot, compared with $88 per foot for a bridge of conventional design with 18-ft. roadway. The saving in deadweight achieved by the new and lighter design is another attractive feature.

Where the problem involves the widening of an old, narrow concrete bridge this may often be achieved by cutting away the concrete hand rail and replacing it with a steel guard rail placed flush with the outside of the concrete slab, and bolted securely to it. This arrangement will generally add about 2 ft. to the width on each side of the roadway, and the weight of

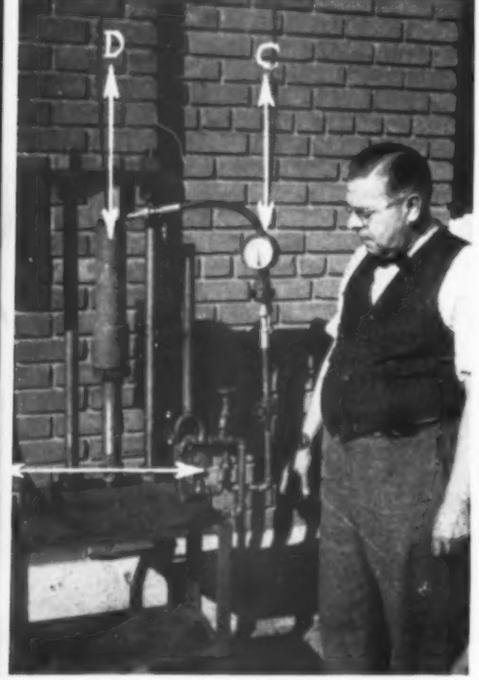
★ Typical bridges built recently in Georgia, utilizing steel hand rails. Located at Hagen and Surrency, Ga., these structures illustrate method of fastening posts temporarily with four bolts and heavy plate washers, to allow for correction in alignment. Posts later welded to plates

the concrete removed is usually sufficient to offset the weight of the steel handrail and the other new materials required. Thus the remodeled bridge may actually be lighter than the original structure, and permit an increased live load.

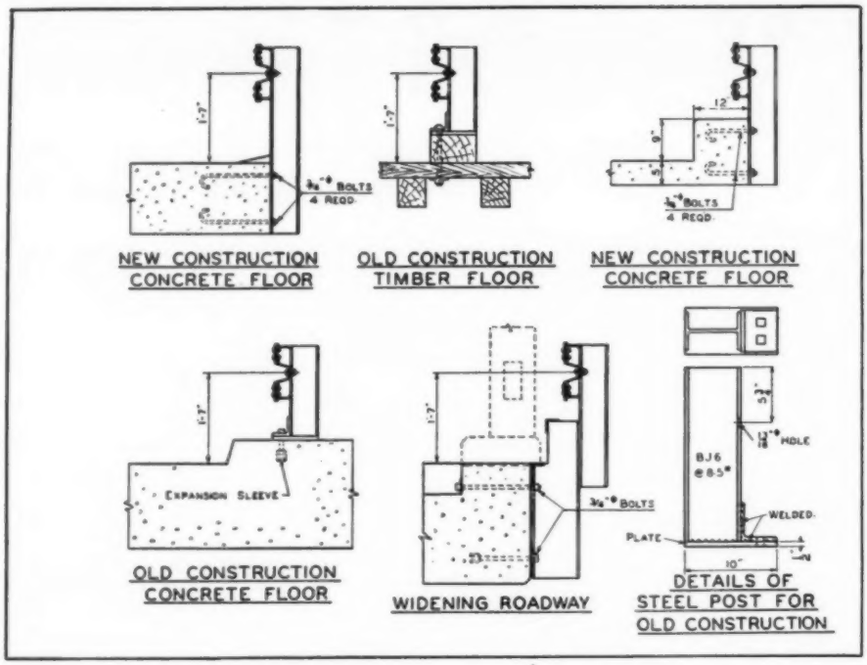
An added advantage offered by the all-steel hand rail is, that it lends itself very well to various architectural designs, and that it offers far better visibility than the massive concrete rails.

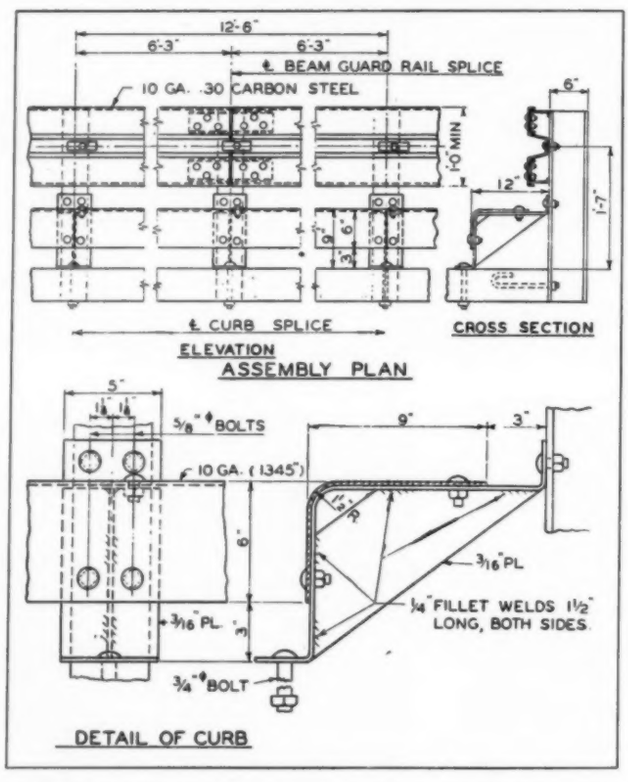
Hydraulic Ram Tester Built by County Employe

A GREAT number of road machinery units and trucks of the Wayne County Road Commission are now equipped with hydraulic rams to handle the heavy operations, such as raising and lowering of grader blades, scarifiers, and snow plows. Naturally, machine parts to which they are attached are extra heavy and the removal and replacement of the rams requires extra help and is obviously a major operation. Therefore, if after a ram has been repaired, it should show an oil leak, the entire operation must be repeated. Not only does this add to the cost of repairs, but it renders a valuable piece of equipment inactive for a long period of time. It was a desire to overcome this delay which inspired a shop employee of Wayne County (Mich.) Highway Department to design and build a testing machine (shown in the photograph). This employe is Herman Hoger, chief mechanic and tool maker of the County's shop force.



★ Herman Hoger of the Wayne County shop force, with the testing equipment. (a) Oil tank to supply line. (B) Hand actuated hydraulic pump. (C) Pressure gauge. (D) Ram to be tested.





★ Fig. 1. Details of guard rail suggested for various common situations

Fig. 2. Guard rail and curb combination

The ram to be tested is placed in the position D and the oil supply from the hydraulic pump B is attached near the gauge C. The pressure is then raised to the working pressure of the ram which duplicates the actual working conditions it is subject to. It will be noted that the machine is built to withstand considerable push, 400 lb. psi. on a 2½-in. ram develops a push of 1964 lb.

Highway Contracts Pass Billion-Dollar Mark—Construction contracts awarded by state highway departments in the fiscal year ending June 30, 1948, passed the billion dollar mark, setting an all-time record on the money value of road improvements undertaken in any one year, according to the 1948 annual report of the Public Roads Administration. Contracts awarded during the fiscal year amounted to $1,058,927,000, as compared to $817,742,000 in the preceding fiscal year. The figures include Federal-aid and non-Federal work.

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New Construction Equipment and Materials

1

Motor Grader

A new BD-3 motor grader, the third new grader to be introduced by the company in six months, has been announced by the Tractor Division, Allis-Chalmers Manufacturing Co., Milwaukee, Wis. This 19,042 unit has many features of earlier Allis-Chalmers graders in addition to new developments. The grader is powered by a 78 brake h.p. General Motors 2-cycle diesel engine and has six speeds forward, ranging from 2.21 m.p.h. to 15.58 m.p.h.

BD-3 Motor Grader

and three reverse speeds ranging from 2.64 m.p.h. to 5.74 m.p.h. A tubular frame gives the unit a strong rigid backbone and also permits enclosed controls which cannot be knocked out of commission. Mechanically controlled front-mounted lift cases provide direct down-pressure which, in turn, maintains rigid blade settings measured to a fraction of an inch. A 28 in. throat clearance enables the BD-3 to handle bigger windrows. The exclusive Allis-Chalmers "Roll-Away" moldboard is a feature of the grader. The blade has a full 360° swing which enables the operator to grade either forward or reverse.

2

Reduction Unit

The Detroit Industrial Air-Cooled Engine Division of Continental Motors Corporation, Detroit 14, Mich., has announced the development of a heavy-duty 6-to-1 reduction unit stated to combine high performance characteristics and long service life. While designed primarily for use with the company's 2 h.p. AA7B and AU7B air-cooled industrial models, the new unit, equipped with three extra-capacity needle bearings in a rugged, deflection-free housing, is interchangeable with the standard reduction unit of the 1½ h.p. AA7 and AU7 engines. For owners of equipment powered by these models, an attractive exchange plan has been worked out, whereby they may obtain, on an exchange basis, remanufactured AA7B or AU7B with heavy-duty unit factory-installed. Continental industrial air-cooled engine distributors and dealers throughout the country now have the necessary information to make exchanges under the plan.

3

Small Snow Loader

A new small snow loader, announced by Barber-Greene Co., Aurora, Ill., is designed specifically for small cities, towns, and industrial plant storage and loading areas. This Model 522 snow loader is one-man operated and self-feeding with a capacity up to 5 cu. yd. per minute. For a negligible cost, the new B-G Snow Loader can be converted to an all-year round bucket loader for a variety of bulk loading applications. Low clearance is a feature of the new snow loader, as is its quick portability and maneuverability. Many proven Barber-Greene advantages

New B-G Snow Loader

have been incorporated into the Model 522, such as: automatic overload release, which protects the machine; floating boom, eliminating stress on boom or chassis. Individual steering and crowding clutches, controlling driving, crowding and braking. Spiral feeding device for capacity loading and breaking of lumps and ice.

4

Loader

A new Model C Wagnermobile scoop announced by Mixermobile Manufacturers, Portland 16, Ore., is a further refinement of previous models with one of the main improvements being the addition of planetary drive gears to each of the drive wheels. Instead of direct drive to the wheels, the axle now drives heat treated sun gears that transmit the power to the drive wheels at a gear reduction of 3 to 1. The result is stated to be far smoother action under power and greatly increased life for mechanical parts even with careless or inexperienced operators. The Wagnermobile scoop can still be towed behind a truck or pickup at speeds over 20 m.p.h. by disengaging the planetary drive. Other improvements include

Model C Wagnermobile Scoop

a wider chassis and larger, roomier cab, safety glass, shorter turning radius, simplified hoist control, 600 lb. counterweight, built into machine.

5

Earth Moving Equipment

Three new models of cable-controlled earth-moving equipment are currently in production at the Wooldridge Manufacturing Co., Sunnyvale, Calif. These include the Models BB-85 and BB-120 four-wheel scrapers and the BHD-19 bulldozer. Offering a wide, unobstructed front apron opening of 60 in., the new scrapers feature rear-draft fulcrum leverage and pivot-tilt bowl. The BB-85 has a capacity of 8.5 cu. yd. struck and 11.0 cu. yd. heaped, while the BB-120 carries 12.0 cu. yd. struck and 14.2 cu. yd. heaped. Other engineering advances include higher

Model BB-85 Scraper

yoke clearance and greater ruggedness throughout. Cable is easily accessible, reeved in straight lines without reverse bends for increased life and easy replacement. Shorter wheelbase insures quick turning in crowded quarters. All sheaves are mounted away from dirt and load. Optional on the BB-85 scraper are four 16:00 x 20 tires or six 14:00 x 20 tires. Approximate shipping weight is 16,000 lb. The BB-120 may be equipped with four 16:00 x 24 or four 18:00 x 24 tires, and has an approximate shipping weight

of 19,500 lb. The Wooldridge BHD-19 bulldozer for Allis-Chalmers' HD-19 tractor is designed for rugged service in straight bulldozing operations. Heavy push arms, fabricated from formed channel, telescope for knock-down shipment. Cable to power control unit follows side of tractor frame from a sturdy engine-mounted assembly, providing operator with full visibility. Moldboard, formed from 1 in. plate, is heavily gusseted to withstand greater abuse. Removable 1 in. blade is mounted to a sturdy box-section base, also gusseted to withstand shock. Blade tips, also removable, are of 1 in. manganese-molybdenum alloy. Shipping weight is 8,200 lb.

6

Emergency Lighting System

An automatic emergency light system, produced by Electric Cord Co., 30 Church St., New York, N. Y., supplies instant, automatic light from its own power when usual sources of power fail. Each lamp

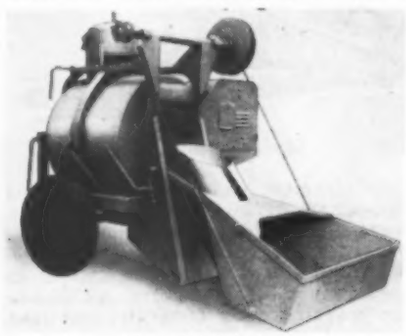
Minuteman Emergency Lighting Unit

head delivers about 100 watts of light and is capable of illuminating approximately 10,000 sq. ft. of area for about 5 hours. When normal current is resumed, the lights of the unit automatically go out and a built-in charger restores power to the battery for the next emergency. No special wiring is required; the unit is plugged into any convenient outlet in the lighting service.

7

3½-S Mixer

A new 3½-S end discharge, non-tilting mixer, equipped with a power loader and automatic water measuring tank, has



New 3½-S Mixer

been announced by Muller Machinery Co., Metuchen, N. J. The machine is equipped with a large skip with a wide throat permitting fast, clean discharge into the mixer drum when the loader is raised. The water tank is mounted on the discharge side to prevent moisture from clogging up the nose of the skip. The mixer permits dumping from wheelbarrows directly into the loading skip, eliminating the necessity of high shovelling into the batch hopper. The machine is mounted on pneumatic-tired disc wheels, equipped with Timken bearings.

8

Pipe Bender

A portable hydraulic pipe bender, announced by Electric Cord Co., 30 Church St., New York 7, N. Y., bends standard

Lightweight Champ Pipe Bender

pipes in sizes from ¾ in. to 2½ in. right on the job. The hydraulic jack can be removed easily from the frame and used for many other purposes. The bender comes complete with ¾ in., 1 in., 1¼ in., 1½ in., 2 in. and 2½ in. dies.

9

Earth-Shock Acceleration Detector

A new instrument which measures the intensity of explosion shock waves passing through the earth has been announced by Special Products Division, General Electric Co., Schenectady 5, N. Y. The new device is about the size

Detector with both Cover and Guard Ring in Place

of a small tin can. It is designed so that it can be buried near the scene of test explosions, enabling engineers to determine the underground velocity and acceleration of shock waves caused, for example, by use of high explosives on large construction projects. The acceleration detector contains crystals which generate a voltage when under stress. Signals from the crystals are carried through cable to amplifiers and delicate recorders above ground. Four of the new instruments, recently used on the site of Watauga Dam, near Elizabethton, Tenn., gathered data on what sort of shocks occur 130 ft. below a half million pounds of high explosives. The explosions were set off by the Tennessee Valley Authority in constructing an earth dam. These acceleration detectors are not stock items but are "custom built." In each different case, the specific design of the detector is determined by the individual application for which it is to be used.

10

Replacable Bit for Ditcher Teeth

A quick-change rooter bit developed by Gar Wood Industries, Inc., Findlay Division, Findlay, O., consists of two members, a holder which is bolted to the bucket, and a removable bit or cutting edge which can be readily replaced when worn. It is only necessary to hammer new bits into the holder. A wedge-shaped socket or cavity in the holder receives a corresponding shank in the bit. This shank has a V-spline which holds once it is driven into the socket and "stays put." No bolts, keys or special tools are required. To remove

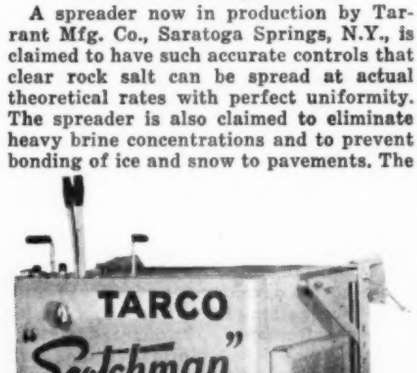
Rooter Bit and Holder

the worn bit a drift pin is placed in a slot in the bit holder and a sharp blow on the pin is applied with a hammer. The bit pops out.

11

Rock Salt Spreader

A spreader now in production by Tarrant Mfg. Co., Saratoga Springs, N.Y., is claimed to have such accurate controls that clear rock salt can be spread at actual theoretical rates with perfect uniformity. The spreader is also claimed to eliminate heavy brine concentrations and to prevent bonding of ice and snow to pavements. The



Scotchman Rock Salt Spreader

engine is completely weather-proofed. No rain, snow or salt dust can reach it. All vital parts are stainless steel. The only

wearing part, the powerful impeller, is mounted on sealed, self-aligning ball bearings. For instant starting the engine is equipped with a push-button starter. For night operation there is a light inside the hopper and another on the back. These lights aid both the operator and the driving public.

12

Shovel-Loader

A combination shovel-loader, announced by Dempster Brothers, Knoxville, Tenn., works on a hydraulic crowd and hoist principle. It is designed to dig hard materials as well as to handle loose materials. It is claimed to be able to dig

Type GRD, Model 100 Dempster-Diggster with 1 cu. yd. bucket Digging in Hard Chut.

15 in. below grade and to a height of 15 ft. above grade. It has a clearance for dumping of 10 ft. 6 in. It has a variable crowd action at any digging position. It has dual steering wheels and a 16 ft. turning radius. The machine is powered by a 110 h.p. 6-cylinder gasoline engine. A 98 h.p. 6-cylinder diesel engine is optional. The following buckets are available: 1 cu. yd. digger with teeth; stockpile bucket, 1¼-1½ cu. yd. capacity; coal loading bucket, 2 cu. yd. capacity.

13

Automatic Line Oiler

A new line oiler designed to protect against running rock drills or other air actuated equipment without adequate lubrication has been announced by Gardner-Denver Co., Quincy, Ill. Known as

LO12 Automatic Line Oiler

the LO12 automatic line oiler, this new device shuts off the line air automatically when all the oil in the reservoir has been used. In operation, the LO12 automatic line oiler delivers a carefully metered flow of atomized oil from any position, either vertical or horizontal and all of the oil is consumed. The flow of oil is metered so that any pneumatic equipment using from 25 to 500 cu. ft. of air per minute can be efficiently lubricated. The oil capacity of the LO12 line oiler is one pint, and it is not necessary to shut off the line air, or to stop the machine to which it is attached, in order to refill the reservoir. The manufacturer reports that special construction of the LO12 makes it impossible for oil in the chamber to become emulsified and mixed with water. And the LO12 is said to be easy to service, for all parts may be withdrawn by hand, once the bushing on the inlet end has been removed.

14

Road Grader Tires

A new line of road grader tires with an extra heavy cord body and especially compounded tread and shoulder rubber has been announced by the Pennsylvania Rubber Co., Jeannette, Penn. According to R. B. Cave, vice president in charge of sales, the heavy cord body will stand the hard usage given this type tire by contractors and road builders. Cave said that the new tread and shoulder rubber gives increased resistance to cuts and snags. Available in all sizes and plies from 900-24 through 1300-24 in the vacuum cup cleated type and in sizes 700-24 through 900-24 in the rib type.

15

New electric welder

Recently announced is a new unit for welders, a compact welding generator in which there is no commutator, no rings, no brushes, no brush holders, and no excitor. The manufacturer claims it can take all AC and DC welding rods. It is made in three amperage ranges, continuous duty 180 amps., 280 amps., and 380 amps. at 65 to 95 volts open circuit. The new unit is driven by V-belt pulley from any strong enough power unit available, or may be obtained all connected up to an engine and mounted on a rubber tired 2-wheel trailer. An outstanding feature of the generator is the extra 5KW electric power supply built into it for flood lighting or other use.

The AC Devices Company, 8006 Champlain St., Chicago, Ill., manufacturer, claims its total weight to be less, by a large percentage, than other similar units.

16

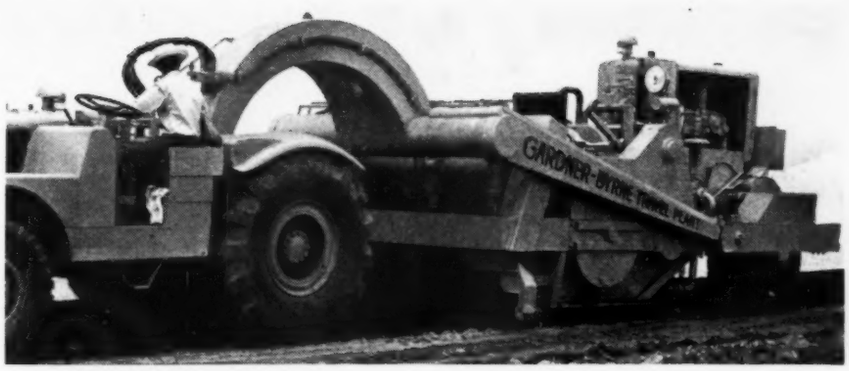
Hose for Pile Drivers

An oil-resistant, high-pressure steam hose for pile drivers, developed by United States Rubber Co., Rockefeller Center, New York, N. Y., is especially designed to withstand the deteriorating effects of a combination of steam and hot oil which occurs when lubrication is applied to pile driving tools through steam pressure lines. Its braided wire construction is stated to give it unusually high bursting strength and to act as an armor to withstand heavy external abuse, both important safety features for operators handling pile driving equipment. The hose is constructed of a rubber core especially compounded for oil resistance, two or three plies of braided steel wire, depending upon the diameter of the hose, one ply of asbestos cord, and a heat resistant rubber cover. It will be marketed under the trade name "Matchless Pile Driver Hose."

17

Travel-Mix Plant

A one-pass traveling mixer stated to have a capacity of 600 to 750 tons per hour, developed for emulsion or cement stabilization and for bituminous road mix paving, is being manufactured by Gardner-Byrne Construction Co., Inc., 649 South Olive St., Los Angeles, Calif. Self-powered by a 135 h.p. Diesel motor and with complete hydraulic one-man control, the mixer can be fitted to the purchaser's tow-tractor or it is offered in combination with a tractor, as illustrated. Water or liquid bitumen and forward travel are accurately metered, both being clearly shown



Travel-Mix Plant with Tractor

on a single large dial in full view of the operator. This, together with adjustable control of the aggregate flow, is stated to assure positive proportioning. A spool on which is mounted six opposing rows of large harrow-type discs rotates at relatively high speed, gathering the material from the windrow and carrying it through the mixing cycle, the action being not only circular but beating back and forth as well. From the mixing spool the material is thrown onto a high speed 'spinner', which re-windrows it behind the mixer.

18

Snow Plow Wax

A new, improved universal grade of Penn Drake Snow Plow Wax suitable for spray as well as brush application, has been announced by Pennsylvania Refining Co., Cleveland, O. Applied to plow moldboards and wings, this wax creates a hard, slick surface off which snow slides easily. It prevents "piling," helps to eliminate costly clearing delays and breakdowns from overloading. Wax can be sprayed on with an ordinary paint spray gun or applied with an ordinary paint brush. Temperature at application should be above the freezing point and the surface should be dry. The plow can be placed in service shortly after waxing. One gallon of sprayed wax covers approximately 300 sq. ft. of plow working surface. Brush application covers 250 sq. ft. per gallon.

19

Scoop Loader

A new front end loader attachment announced by The Galion Iron Works & Mfg. Co., Galion, O., is designed for quick, easy attachment to the Galion No. 402 maintenance motor grader. Lifting operation is by hydraulic power under

finger-tip control from the grader seat. Operation is independent of scarifier. Loaded bucket is tripped by manual cable control. According to the specifications, the capacity of the standard ma-

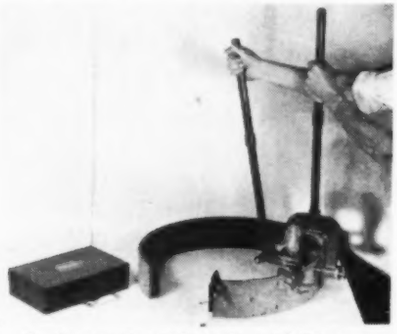
Front End Loader Attachment on Motor Grader

terial bucket is 9 cu. ft. An extra-large snow bucket is available. Maximum lifting height is 9 ft. 10 in.; dumping clearance 8 ft.; forward reach 4 ft. 6 in.

20

Industrial Riveter and Kit

Availability of the new Raybestos portable industrial riveter and kit has been announced by The Raybestos Division of Raybestos-Manhattan, Inc., Bridgeport, Conn. The riveter is suitable for relining shovel, crane, drag line and tractor bands up to 10 in. in width, either internal or external, which use 7, 8, or 10 series tubular rivets. The riveter is of sturdy construction and can be disassembled to fit in a small compact box. The kit comes complete with a hand riveter, drills, counterbores, clamps, and a wrench. The drills



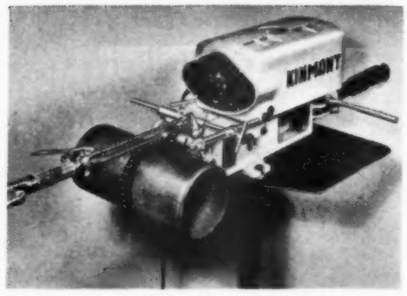
Raybestos Portable Industrial Riveter

and counterbores are made to fit any standard ¼ in. drill. The counterbores feature a gauge for setting depth of countersink, opening for chip elimination and are equipped with pilot pins.

21

Cutting Torch Attachment

A new cutting torch attachment is an important accessory now available for use with the Kinmont Universal Power Unit of Kinmont Manufacturing Co., Inc., Glendale, Calif. The principal features of this attachment are its provision for easy and fast adjustment of the cutting torch in handling a wide range of pipe sizes, and its ability to maintain a smooth bevel



Cutting Torch Attachment

and a square cutoff across the end of the pipe. The wide adjustment range of the cutting torch attachment permits its use on any pipe size from 3 in. up to 36 in. in diameter, and on tanks up to 10 ft. in diameter when turned on a roller rack.

MANUFACTURERS' LITERATURE

22

Road Sweeping Magnet

A bulletin describing the new Dings high intensity road sweeping magnet has been released by Dings Magnetic Separator Co., 4740 W. McGeogh Ave., Milwaukee 14, Wis. The magnet is designed for mounting on a truck with power supply from a portable engine-generator set. It has a triple pole design that gives strong penetration, an even field across the en-

tire width, and a magnetic pickup effective to about 12 in. from the magnet face. The unit is available in lengths of 36 in., 48 in., 60 in., 72 in, 84 in. and 96 in., can cover between 10-40 miles per day. Users report these magnets have picked up from 5 to 25 lb. of metallic objects per mile.

23

Effect of Calcium Chloride on Portland Cement

A new 40-page semi-technical booklet, of interest to architects, engineers and others concerned with specifications, design or production of portland cement concrete, has been issued by the Solvay Sales Division, Allied Chemical & Dye Corporation, 40 Rector St., New York 6, N. Y. This new book condenses from research and technical reports the effects of adding measured quantities of calcium chloride to portland cement mixes. It contains tables, graphs and charts covering setting time, early strength, curing, slump, density, surface wear, shrinkage, and ultimate strength. Also shown are effects of varying temperatures and cold weather, and the results with special cements including air entraining, high early strength, and low heat cements.

24

Cable Connections for Welding

A new 12-page catalog issued by Tweco Products Co., P.O. Box 666, Wichita, Kan., illustrates the complete line of Twecotong and Hol-Grip electrode holders, Redhead ground clamps, cable connectors, terminal connectors, cable splicers, Twecolugs and carbon electrode holders. New six bracket quantity price schedule and parts information is included. Contains valuable information about the maintenance and care of electric welding cables, connections, ground and holders.

25

Snow Loaders

The complete line of Haiss snow loaders, including Model 75 WS (wheel mounted), Model 75 CS (crawler mounted) and Model 300 WS-SBC (with swivel belt conveyor), is described and illustrated in detail in a new 16-page snow loader catalog now available from George Haiss Mfg. Co., Inc., New York, N.Y., division of Pettibone Mulliken Corp., Chicago. All major dimensions and specifications of the three Haiss snow loader models are included in the catalog, along with engineering drawings of the loaders in both operating and travel positions. A section devoted to the Model 300 WS-SBC shows how the swivel belt conveyor on this model simplifies and speeds loading regardless of traffic conditions.

26

Road Construction and Maintenance

Some of the uses to which Caterpillar diesel motor graders are put by state, county and township bodies are shown in a booklet recently released by Caterpillar Tractor Co., Peoria, Ill., under the title "Building and Maintaining State, County and Township Roads With 'Caterpillar' Diesel Motor Graders."

27

Land Clearing

Clearing methods for reclaiming productive agricultural land, construction sites, mine and quarry operations, housing projects, and applications in the export field are featured in a new 15-page illustrated booklet "Clearing for Action," issued by Caterpillar Tractor Co., Peoria, Ill.

28

Tunneling

A 4-page folder published by Armco Drainage & Metal Products, Inc., Middletown, O., describes how the use of lightweight corrugated liner plates has simplified tunneling procedure. Other advantages described are less excavation, fast assembly, greater safety above and below ground, no hindrance from bad weather, no destruction of expensive pavements or railway roadbeds, and freedom from settlement and future maintenance. Uses illustrated are for new sewers, relining of failing sewers and culverts, service tunnels for utility lines and pedestrian and livestock underpasses.

29

Corrugated Metal Pipe

Fabrication, specifications and installation of Penco corrugated metal pipe are featured in a bulletin of Penn Metal Corporation of Penna, Oregon Ave. and Swanson St., Philadelphia 48, Pa. In-

cluded in the bulletin are 12 advantages claimed for the pipe, diagrams showing typical installations of perforated pipe for subsoil drainage, specifications, and tables of capacities of corrugated pipe culverts and cubic yards of excavation per lineal foot of trench, and suggestions for handling and installing corrugated metal pipe.

30

Snow Loader

An attractive, two-color, 8-page brochure graphically describing operations and features of the new Barber-Greene Model 522 snow loader is now available from Barber-Greene Co., Aurora, Ill. Controls, various operating features and principles are adequately described. More than a piece of product literature, this booklet presents facts and figures to illustrate how the machine can pay for itself in one season by truck time savings alone.

31

Testing Equipment

A 62-page catalog issued by Humboldt Mfg. Co., 2014 North Whipple St., Chicago 47, Ill. covers its line of testing equipment. Illustrations and descriptions are given of asphalt, tar and petroleum testing equipment; cement and concrete testing equipment and soil testing equipment. Other products illustrated and described include balances and weights, drying ovens, laboratory stirrers, and testing sieves and shakers.

32

Soil Sampling Kit

A collection of 12 different earth and soil sampling tools is illustrated and described in a circular issued by Acker Drill Co., Inc., Scranton 3, Pa. The tools can be used in subgrade testing for airfield runways, for test borings for bridge foundations, for subgrade testing for highways, for testing base materials for soil stabilization, for soil density boring data for determining moisture content previous to soil compaction, and soil density for bearing data.

33

Road Sweeping Magnets

A new 4-page illustrated bulletin on separation magnets, announced by The Ohio Electric Mfg. Co., 5900 Maurice Ave., Cleveland 4, O., gives detailed information on the application, construction, selection and suspension of Ohio separation and road sweeping magnets. It also contains detailed data on field attraction and penetration, magnet dimensions, weights and lifting capacities of all Ohio circular and rectangular separation magnets.

Airport Runway Base Construction

(*Continued from page* 77)

pockets were found in the hydraulically placed material during mixing and compacting operations.

All ducts for runway lighting were installed after completion of base and pavements. In cutting through the pavement to install ducts, the base was found to be very uniform in thickness, testifying to the thoroughness of the Flynn Roadbuilder to mix to an 8-inch depth, and to the accuracy of subsequent windrowing and spreading operations. The base was found to be completely dehydrated throughout, uniformly compacted, and extremely tough to cut.

Although not now in use by the Army, the runways of this airfield are reported to be in splendid condition.

Highways Can Be Tailor-Made

(*Continued from page* 75)

sibility of building a road exactly suited to the existing traffic and climatic conditions.

These two typical projects clearly define the meaning of tailor-made roads in Kansas.

A review of all of the factors involved for each project and the resulting design, as well as the costs, reveals how precisely the foundation and wearing courses are tailored to the various conditions which affect the permanence of the road.

Both projects will handle their own traffic in their own locality with equal efficiency.

With a sufficient quantity and quality of project data and by using a method of measuring soils and soils-mixtures strengths by the triaxial apparatus, economical yet adequate load carrying courses can be built.

City-Wide Street Program Performed Under Management Contract

(*Continued from page* 67)

officials debated as to whether part of this cost should not have been placed under the "equipment" heading. In July, the cost per ton was reduced to $4.81; in August, to $4,71; in September, to $4.68 and in October to $4.44. The over-all cost per ton was $5.08.

Laying of the asphaltic concrete averaged $1.11 per ton, or 59c per sq. yd., and the cost of seal coating averaged 8.4c per sq. yd.

In yardage figures the program encompassed 719,985 sq. yd. of bituminous concrete, with 726,501 sq. yd. seal coated.

What did the taxpayers think of this spending? Well, in the first place everyone was glad to put his vehicle back on a smooth and even keel. In the second place, the City of Colorado Springs owns the department of public utilities. The utilities department had an unused $500,000 in a deferred maintenance fund and Council and utilities' heads saw no need for retention of the fund. So the Council transferred the money to the city's general fund—and thus paid for the cost of the 1948 paving project!

WITH THE MANUFACTURERS & DISTRIBUTORS

Madden Made Haiss Vice President

E. J. Seifert, President of Pettibone Mulliken Corporation, Chicago, Ill., and subsidiary corporation, George Haiss Mfg. Co., Inc., New York City, has announced the appointment of W. E. Madden to vice president of the George Haiss Mfg. Co., Inc. Mr. Madden was appointed Sales Manager of the Conveyor Division of Haiss last year and has been responsible for the outstanding development of Haiss conveyors for coal, aggregates and package handling.

New General Tire Branch Managers

In a move designed to serve more adequately the General Tire & Rubber Company's expanding markets, Vice President L. A. McQueen has announced the appointment of five new branch managers and the opening in Richmond, Va., of a new branch sales outlet. The new branch managers assigned are: Earl H. Schaub, Denver; William W. Ferguson, Buffalo; Richard Graybill, New York, John W. Bogle, Richmond; and James J. Flasco, St. Louis.

W. R. Wilson Is Dead

William R. Wilson, president of Conklin & Harrington, Inc., construction machinery exporters and treasurer of the Good Roads Machinery Co. of New York, Inc., equipment distributors, died in New York City on Dec. 2. Mr. Wilson entered the construction machinery industry in 1912 with the Tarrant Manufacturing Co. of Saratoga Springs, N.Y. In 1916 he became sales manager of the Good Roads Machinery Co. at Kennett Square, Penn. While with Good Roads, he was loaned to the War Resources Board in Washington, D.C., during World War I, as an authority on construction equipment, and served on that committee throughout the war. Mr. Wilson returned to the Good Roads Machinery Co. and in 1927 joined the late Walter G. Harrington in the Good Roads Machinery Co. of New York, Inc. He was particularly active in pioneering snow-fighting equipment in the New England States and in distributing Galion road machinery and the Klauer "SNOGO." On the death of Fred H. Conklin, vice-president and manager of Conklin & Harrington, Inc., in 1941, Mr. Wilson was elected to that office, becoming president after the recent death of Walter G. Harrington. He will be succeeded as president of Conklin & Harrington, Inc., by Herbert A. Harrington.

New Davey Dealer

Thurston Cooke Equipment Co., Louisville, Ky., has been appointed a Class A dealer for Davey Compressor Co., Kent, O. The territory will cover the state of Kentucky and the Cooke Co. will handle all items of Davey Manufacture.

A. W. Wagner Promoted by Thew

A. W. Wagner

A. W. Wagner has been appointed general parts division manager for The Thew Shovel Co., Lorain, O. His new duties include the supervision of Thew Plants Nos. 3 and 5, both located in Elyria. Mr. Wagner will temporarily continue his duties as manager of parts division sales. He in turn, appointed Cyril Brecknock, manager of parts division manufacturing in charge of Plant No. 5. N. W. Anderson was named manager of parts division operations, being responsible for parts division planning, production control, warehousing and shipping. Don Lewis was appointed manager of parts division publications and catalog design.

Motorola Personnel Changes

Following the recent appointment of Robert W. Galvin as executive vice-president of Motorola, Inc., Chicago, Ill., Paul V. Galvin, president, has announced that he has named Walter H. Stellner vice-president of merchandising and Elmer H. Wavering, vice-president of product design. Mr. Stellner was formerly vice-president in charge of home radio and television set design and Mr. Wavering was vice president in charge of automotive product design. Under the new organizational structure, Mr. Wavering will be responsible for consumer product engineering; home radios, auto radios, television sets and car heaters. Mr. Stellner will supervise all merchandising, including sales, advertising, market research, and service.

Universal Atlas Appointment

Charles L. Peyton has been appointed district sales manager, Illinois-Wisconsin District, effective Dec. 1, 1948, with office in Chicago, for the Universal Atlas Cement Co., United States Steel Corporation Subsidiary. Mr. Peyton brings to his new responsibilities the knowledge and experience of a 37-year sales career in the cement industry, the last 13 years of which he has been the Universal Atlas sales representative in the district over which he now becomes sales manager.

Appointed Byers District Sales Manager

John F. VanWay has been appointed Midwest district sales manager with offices in St. Louis, Mo., for The Byers Machine Co., Ravenna, O. Mr. Van Way, a graduate of the University of Illinois, has had 16 years sales and advertising experience. For the past 8 years he has been associated with the heavy construction equipment field. Prior to joining Byers, Van Way operated his own firm, Service Construction and Industrial Equipment Co., in St. Louis. Mr. R. E. Boehck, formerly Byers district sales manager in the Midwest and Southwest areas will now concentrate in the Southwest territory with headquarters at Houston, Tex.

Byrd Made District Manager

D. J. Byrd

D. J. Byrd has been appointed district manager in the Southeast region for Gar Wood Industries, Inc., Wayne, Mich. He will be responsible for the sale and distribution of Wayne Division hoists, bodies, winches, cranes and load-packers; Findlay Division ditchers, shovels, spreaders, finegraders, highway wideners and tractor equipment, and St. Paul Division hoists, bodies and truck patrols in Alabama, Georgia, Florida and Eastern Tennessee. In South Carolina he will be responsible for the sale and distribution of Findlay Division products only.

Prior to his appointment as District Manager, Mr. Byrd was a salesman at the Washington Branch of Gar Wood Industries, Inc.

Snow Plow Wax Distributors Wanted

Pennsylvania Refining Co. announces that it is establishing a national sales organization for the distribution of its new liquid wax, Penn Drake snow plow wax. This product is reputed to make faster, easier and better snow removal possible by providing a tough, snow repellent coating on plow surfaces. Distributors interested in handling this product should write direct to the company at 2686 Lisbon Road, Cleveland 4, O., for price list SDS-2 and complete details. Penn Drake snow plow wax is advertised in a long list of highway and construction publications including: Construction Digest, Contractors and Engineers Monthly, Roads and Streets, Public Works, New England Construction, Mid-West Contractor, Constructioneer and Western Builder.

David S. Day Retires

David S. Day, sales manager, Duluth, Minn., has retired after 41 years of continuous service with Universal Atlas Cement Co., United States Steel Corporation Subsidiary. Mr. Day joined the cement company as a salesman in 1907. He began his career with Universal Atlas as salesman at Minneapolis, transferring in 1908 to Pittsburgh, and 1910 to Chicago. He returned to Minneapolis in 1912 and there, in 1914, became office manager. In 1918, he was advanced to assistant Northwestern sales manager and, in 1935, was appointed sales manager of the Minneapolis office. Since 1947, he has been sales manager of the Duluth office.

Making Wire Rope

A colorful 4-color sound film entitled "Indian Paint" is now available for public showing. The picture runs for thirty-five minutes, vividly portraying the making of steel from ore to finished product—wire rope. The story is described so that the film is both educational and entertaining. Arrangements can be made for the showing of the film, without obligation before any group or organization by writing to The Colorado Fuel and Iron Corporation, Wickwire Spencer Steel Division, Palmer, Mass.

Keplinger Promoted by Hercules Motors

John C. Keplinger, vice president in charge of sales of Hercules Motors Corporation, Canton, O., has been promoted to executive Vice President. He has been associated with the Hercules Company since July, 1926, and has served progressively as a member of the sales staff, sales manager and vice president in charge of sales. He will continue to direct the sales activities of the company. Other officers include Gordon M. Mather of Toledo, O., chairman of the board; Charles Balough, president and general manager; M. C. Kuepfer, vice president in charge of production; A. R. Miller, vice president in charge of purchasing and traffic; D. W. Latta, vice president in charge of special engineering; Harry P. Blake, vice president (inactive), and John D. Cook, secretary-treasurer.

Bohuslav Joins LeTourneau

H. A. Bohuslav

Hans A. Bohuslav has been appointed special engineering consultant to R. G. LeTourneau, president of R. G. LeTourneau, Inc., Peoria, Ill., and Longview, Tex. Mr. Bohuslav goes to the LeTourneau Co. from Engineering Controls, Inc., of Los Angeles, Calif., where he was vice president in charge of engineering and production. Bohuslav is recognized throughout the engineering profession as an outstanding authority on high-power diesel and gasoline engines. His knowledge of engines and their application to heavy duty machinery will be a valuable asset to the LeTourneau Co.

Syntron Appointments

Syntron Company, Homer City, Pa., have announced the following additions to their sales personnel and the establishment of new sales offices. Mark Chisholm has been appointed district sales manager of the newly-established sales office in Des Moines, Ia. Ernest K. Hood is the district sales manager of a new sales office in Kansas City, Mo. R. K. Bentzien has been added to the Milwaukee, Wis., sales office staff, taking charge of the power tool and paper jogger sales.

Benedict Appointed Research Director

Shephen W. Benedict has been appointed director of research for The Master Builders Co., Cleveland, O. For the past seven years Mr. Benedict has been materials engineer in the cement and concreting materials section of the National Bureau of Standards in the capacity of assistant chief of the Cement Reference Laboratory and consultant on statistical problems in the Division of Mineral Products. Prior to joining the National Bureau of Standards staff, Mr. Benedict served as materials engineer with the Illinois Division of Highways and as structural engineer with the National Advisory Committee for Aeronautics.

Sales Manager for Foster Trailer

Foster Trailer Co., Los Angeles, Calif., has announced the appointment of Walter W. Harvey and Conrad P. Herman as the new heads of sales. Mr. Harvey, who was formerly with the War Assets Administration on heavy construction equipment, will be in charge of retail sales. Mr. Herman will be national sales manager for distributors and dealers. He was formerly with the Reynolds Aluminum, Truck Body Division. These appointments form the nucleus for an expanded sales effort by the Foster Trailer Co., to seek distributors and dealers for their complete line of tilt-type trailers.

Distributors Wanted

Pennsylvania Refining Co., Cleveland 4, O., announces that it is establishing a national sales organization for the distribution of its new carburetor and fuel system cleaner, Penn Drake Gumout. This product is reputed to be a powerful gum solvent which dissolves all harmful gum, varnish and lacquer deposits in the entire fuel system—"a carburetor tune up while you drive." It also is stated to eliminate moisture and prevents frozen gas lines. And is claimed to be an excellent bench cleaner. According to the company, Gumont is sold through recognized distributors only. Those interested in handling Penn Drake Gumout should write direct to the maker at 2686 Lisbon Road, Cleveland 4, O. The concern also states that several territories are open to manufacturers' representatives. Live-wire, sales-minded agents are invited to write for complete details on the opportunity.

Ransome Moved to Dunellen

Worthington Pump and Machinery Corporation has announced that the manufacturing and distributing activities of its subsidiary, Ransome Machinery Co., are now being conducted by the parent corporation. Manufacturing operations for the lines previously manufactured by Ransome will be carried on at Worthington's Dunellen Works, Dunellen, N.J., the same location formerly used by Ransome Machinery Co. Sales activities will be directed from Worthington's executive offices at Harrison, N.J., through the Ransome Sales Division located at the Dunellen Works.

OTC Opens N. Y. Warehouse

To speed up deliveries and give faster service to OTC distributors in the New York trade area, the Owatonna Tool Co., Owatonna, Minn., has opened a warehouse at 54 Macdougal St., New York, N.Y. This warehouse carries a complete and adequate stock of OTC pullers, puller sets, puller parts, wrenches of all types and many special tools. This warehouse will sell on a wholesale basis only to regularly authorized OTC distributors.

Asphalt Paving Plant

Its new 1000 lb. portable batch-mix asphalt plant is described in a 12-page illustrated bulletin released by Madsen Iron Works, Huntington Park, Calif. Bulletin gives complete erection and operating data, includes specifications and diagrams.

Maynard Promoted by Thew

R. T. Maynard

Robert T. Maynard has been promoted to the position of export manager for The Thew Shovel Co., Lorain, O. He was heretofore district Sales manager of the Thew Mid-Atlantic territory with headquarters in Washington, D. C. After his college training at Dartmouth College and New York University, Mr. Maynard spent several years with an export-import house in New York. From 1939 until early 1948 when he joined Thew, Mr. Maynard served as export manager for The Osgood Co. and The General Excavator Co. of Marion, O.

Chain Belt Opens New Warehouse

Chain Belt Co., Milwaukee, Wis., has established a new Atlanta warehouse at 878 Ashby St., N.W., Atlanta, Ga. The Atlanta District office will also be located at this address under the direction of J. S. Moore, District Manager. The new warehouse will be under the supervision of G. J. Schuelke formerly of the Milwaukee office. The new Atlanta warehouse will serve the entire Southeast including the states of North Carolina, South Carolina, Virginia, Georgia, Florida, and Alabama. A 24-hour delivery service will be available to most parts of the territory served.

HEAVY DUTY STEEL TRUCKS

Motorized Truck-Man For Sale

22 — 6" Channel Iron Frame, Gussetted, Castered Trucks. Some knocked down, some assembled. Also three brand new Truck-Man Motorized Hydraulic Lift-Trucks. Under-clearance suitable for above trucks.

R. L. FORINGER, Inc.
317 State Tower Bldg., Syracuse, N.Y.

FOR SALE

3—Wooldridge Terra Cobras with all the improvements, in very good working condition.

1—D8 Tractor, overhauled this spring.

1—LaPlant-Choate Carrimor Scraper #C-84-243

THORNTON CONSTRUCTION CO., INC.
Hancock, Mich.

FOR SALE

1 TD9 International with BE front end loader and dozer combination

1 1-yard Page Dragline Bucket like new, $300
Above tractors in A1 condition and priced right

1 RD 7 Caterpillar with LeTourneau Angledozed and PCU

2 NEW Lessman ¾ yd. front end loader. These are a buy at less than factory cost.

We also have a large assortment of spare Caterpillar and International parts for most sizes of tractors.

TRI-STATE EQUIPMENT CO., INC.
541 Lumber Exchange Bldg.
Phone MAin 3643 Minneapolis

FOR SALE

TARPAULINS

New waterproof 12-oz. material and grommets

12x16	$14.75
15x20	22.50
18x24	32.40
20x20	30.00

Immediate delivery.

L. K. LIPPERT EQUIP. CO.
297 S. High St. Columbus 15, O.
Phone: Adams 8839

1 No. 35 Caterpillar with Dozer and extra set of Tracks.
37B Bucyrus Erie Comb. Shovel & Dragline
1 No. 65 Caterpillar with Dozer.
Adams 51 Patrol
1 1½ yard Gas Air Shovel.
1 Crushing Plant on Pneumatic Tires. 9 x 36 Pioneer Crusher, 18 x 30 Roll Crusher. 3 ft. x 10 ft. Shaker Screen.
2 Oil Distributors.
1 Sand Spreader, small.
Diamond Roll Crushers 14" x 22".
1 2-Deck 4 ft. x 8 ft. Niagara Screen.
1 3-Deck 4 ft. x 8 ft. Niagara screen.
A Complete Stationary Washing, Screening and Crushing Plant at Necedah, Wis. Items for this plant for sale. Send for Bulletin.

TAYLOR & TAYLOR, Inc.
307 Providence Bldg.
Duluth, Minn.

FOR SALE

2—1946 Model HA FWD Trucks with hydraulic dump bodies.
2—1947 Model V 8 Ford Trucks with hydraulic dump bodies.
These trucks can be bought with or without dump bodies.

See or write
ANDERSON BROTHERS
Road Contractors
817 Mill Ave. Brainerd, Minn.
Tel 1710-LW

CRANE—FOR SALE

Buckeye Clipper—¾ yd. size with 40 ft. Boom-powered by Buda Gas Engine—New in 1946—Excellent condition.

R. B. WING & SON CORP.
384 Broadway Albany, N. Y.
Phone 3-4161

FOR SALE

1947 Lima paymaster crane $11,000.00
1—D8 "Caterpillar" tractor and bulldozer
2—"Caterpillar" No. 12 motor graders
3—Super C Tournapulls
1—D8 "Caterpillar" almost new with new Le Tourneau (EP) scraper

LEWIS SHAW
DECATUR, ILL. Phones: 26213 or 27172

FOR SALE BY CONTRACTOR-OWNER

One—General Electric 150 H.P. Motor, 3 phase, 60 cyl. 220 volts, complete with starting compensator and entrance wiring, mounted on steel base with power take-off.
One—16-D 16x32 Acme Jaw Crusher.
One—11-D 14x28 Acme Jaw Crusher.
One—No. 19 Kennedy-Van Saun Reduction Crusher, complete with electric drive, starting compensator, oil filtering system, etc.
One—Tel-Smith Circular screen 48 inches by 16 feet, steel mounted. Complete with electric drive.
One—Acme Hollow center, scrubbing & scalping screen, 60 inches by 12 feet. Complete with electric drive.
One—Kennedy-Van Saun 2'x8' double deck vibrating screen. Complete with electric drive.
One—18"x60' Belt Conveyor.
One—18"x35' Belt Conveyor, complete with electric drive.
One—50 foot Bucket Elevator.
One—R-5 Caterpillar Bulldozer with LaPlante-Choate Angle Blade.
One—320 cu. ft. Sullivan Air Compressor, rubber mounted.
One—Ingersoll-Rand Wagon Drill complete with steel to 16'.
One—Byers Junior ⅜ cu. yd. Combination Shovel and Crane (Factory new).
One—Acme 3-wheel 5 ton Fine Grade Roller, with electric starter and scarifier.
6000' of 8x8 Road Forms.
4000' of 7" Road Forms.

LAW BROTHERS COMPANY
200 N. Main St. Herkimer, N. Y.

GREAT LAKES SUPPLY CORP.

Construction Equipment

SALES • RENTALS • SERVICE

Representing

Oliver-Cletrac Wheel and Crawler Tractors
Hercules Road Rollers
Independent Pneumatic Tools
Sullivan Air Compressors and Tools
LaPlant-Choate Scrapers and Bulldozers
Gruendler Company Crushers
Republic Rubber Company, Hose
Sterling Pumps and Hoists
Goodrich Off-the-Road Tires
Murphy Diesel Engines and Generators

General Contractors Supplies

1026 W. 50th St. Chicago 9, Ill. Phone Atlantic 6622

One McKiernan-Terry 9B3 Pile Hammer. Price—$1950.00.

CHARTER OAK CONSTRUCTION CO., INC.
525 Main Street, Hartford, Conn.
Telephone—Hartford—7-3203

REBUILT CRUSHERS

1—No. 6 Champion, Jaw, 12"x26" opening.
1—No. 4½ Champion (No. 10 Beaumont) Jaw, 10"x 20" opening.
2—No. 4 Champion, Jaw, 9"x15" opening.
2—No. 6 Traylor, Gyratory, with T.Z. head.
1—No. 4½ Traylor, Gyratory.
1—Penna. Single Roll Crusher 18"x24".
1—Double Roll Crusher 16"x24".
1—Jeffrey Swing Hammer Mill, Type A, 24"x18".
1—Jeffrey Swing Hammer Mill, Type A, 30"x24".
1—18"x36" Farrel—Type "B"—Not Rebuilt.
1—18" LINK-BELT APRON CONVEYOR—9" pitch, 27' centers, like new.

JOHNSON & HOEHLER, Inc.
P.O. Box 102
Lansdowne, Pa.

FOR SALE

One new D6 Caterpillar Tractor 74-inch gauge, with idlers, roller guards, pull hook, track shoes, lighting system, starting system, street plates, #24 cable control unit, with 6-inch dozer, Hyster 6HW Hystaway, with Hendrix Type L.S. drag bucket. $16,000.00 fob Scottsbluff. Immediate delivery.

Two D13,000 Caterpillar engines & Generators serials 3573-3399 with blower fans, safety devices, alarm switches, flexible fuel lines, synchronizer, electric starting, natural gas carburetors, 440 Volt 60 cycle, three phase, with ESEC Switchboards. In excellent condition, immediately delivery $4900 fob Scottsbluff, Nebr.

One Model SC11A 8-foot vibratory Hand Screed with 60 foot motor lead and one model M2 Jackson Portable Power Plant on steel wheels, 110 volt, 3 phase, 60 cycle with outlet panel and switch $700.00 fob Scootsbluff, Nebr. Practically new. Immediate delivery.

TERRY CARPENTER, LIMITED
Phone 834 or L. D. 16
Scottsbluff, Nebraska

CRANES FOR RENT

Fifteen current model cranes, draglines, shovels, backhoes—also clam and drag buckets, drop hammers, frost balls, floats, overhaul balls, light plants, booms, fairleads, jibs.

TRACTOR & EQUIPMENT CO.
3521 W. 51st St. Chicago, 32

USED DREDGING AND SAND & GRAVEL PLANT

EQUIPMENT ON HAND

Write giving your needs

J. W. MECKENSTOCK & CO.

53 W. Jackson Blvd., Chicago 4, Illinois

ROTARY TYPE SNOW PLOW

Rotary snow plow—straight blade, for mounting on 5 ton truck, 8½ ft. moldboard set at 45 degree angle,—6-ft. wide path. Mfg. by Snow Removal Equipment Co.—power unit Ford V-8 85 h.p., w/cooled, w/generator and starter motor. Chain drive thru remote control, hydraulic operated transmission. With attachments for mounting. Used less than 100 hours. Priced to sell.

STACK CONSTRUCTION CO.
3384 S. Princeton Ave.
Milwaukee 7, Wisconsin Ev. 3-8861

For Sale

2 Koehring Dumpsters—excellent quarry trucks.
1 Badger 16 ton semi-dump, 2 wheel trailer.
1 Telsmith 3-ft. x 6-ft. double deck vibrating screen.
All the above equipment in good running condition.

MURPHY CONSTRUCTION CO.,
Black Creek, Wisconsin

FOR SALE

Cummings Diesel Motor manufactured 1946. 150 HP with twin disc clutch pulley drive. Used very little.

General Electric Generator, AC current, 100 KW, 151 Amps Armature, 3 phase 60 cycle with belt driven exciter.

Blower with 20 HP Westinghouse motor, V belt drive, motor 220 volt, 3 phase.

Belt Conveyor 54' by 13".

Elevating Conveyor 24' long.

F. H. TUXILL
WEEDSPORT, N. Y.

34 E REX

DUAL DRUM PAVER, used on one job as stationary mixer. Perfect condition—Less than half price.

R. W. GEORGE CONSTRUCTION CO.,
34 North Gore Ave.,
Webster Groves 19, Mo.

(2)—Truck Mixers—4½ yard Hi-discharge—Bought new May 1947—Rex make
(1)—Truck Mixer—4½ yard Hi-discharge—Bought new Mar. 1947—Jaeger make
(1)—Truck Mixer—3 yard Hi-discharge—Bought new Jan. 1947—Rex make
(3)—Truck Mixers—4 yard horizontal type—Bought new May 1939—Rex make
(3)—Truck Mixers—5½ yard horizontal type—Bought new Jan. 1943—Rex make

GENERAL SAND & STONE CORP.
P. O. Box 97 Elmwood 10, Conn.

TRANSITS—LEVELS

IMMEDIATE SERVICE

Over 30 Years Repairing All Makes of
TRANSITS & LEVELS

Guaranteed Work by Experts

Will send you shipping case for your instrument. Advise us.

New and Used Instruments in Stock

Buff and Buff—AGENTS—David White

INSTRUMENTS SALES CORP.
325 W. Huron St., Chicago 10, Ill.

NEW WHITE HALFTRACKS

Originally cost gov't $7,000. Now priced at such a very small fraction of that figure. With White 160AX motor, 4-speed trans. with auxiliary 2-speed shift and super power low speed drive. Hydraulic brakes, 900x20 tires. Excellent for logging, skidding, construction work, house moving, dump work. Available with or without winches. We carry a full line of replacement parts.

1,000,000's of G.I. Truck Parts.

Mail Orders Filled.
Write. Phone. Come in.

Wilensky Auto Parts Co.

1226-28 Washington Ave. N.
MINNEAPOLIS, MINN.
AT. 4438 NE. 3758

Used Equipment For Sale

Located at

Ray Construction Company Yard—Mobile Highway—Pensacola, Florida

SUBJECT TO PRIOR SALE

1—Kinney Asphalt Distributor, 812 gal., mounted on Mack Truck.....$4,000.00
1—Etnyre Asphalt Distributor, 708 gal., mounted on 1½-ton 1946 Dodge Truck 4,000.00
1—Rapid Fire Tank Car Heater mounted on 1½-ton 1935 International Truck 2,500.00
1—Barber-Greene Finishing Machine, Model No. 879A, Serial No. 879-6-28.... 7,000.00
1—5-8-ton Galion Tandem Roller, Model "R," Serial 23260 .....2,250.00
1—Rotary Broom and Blower, engine driven 750.00
1—Hough Universal Rotary Broom and Blower, Model "C" with 84-inch Broom 1,000.00
1—Burch Car Unloader, Model SO, Serial 4430..... 1,500.00
1—Car Puller, Tulsa Winch mounted on 1942 Chevrolet Chassis..... 650.00
1—1,600-gal. insulated Tank mounted on 1941 Ford 1½-ton Truck, Motor No. 99T-448390 and semi-trailer..... 1,000.00
1—1,600-gal. Tank mounted on 1943 Dodge 1½-ton Truck and semi-trailer.. 1,500.00
15—Aggregate Truck Spreader Boxes—50.00 ea.
1—Caterpillar 40 Tractor, Serial 3G268 ..... 1,000.00
1—Caterpillar 40 Tractor with LaPlant-Choate Bulldozer, Serial No. 3G1458 ..... 2,500.00
1—P & H, Model 150, ½-yd. Shovel with Dragline and Clamshell attachments, Serial No. 4858..... 4,000.00
1—Mack Truck, 3-ton, 1941, with Heavy Duty 8-wheel 25-ton Semi-trailer 2,500.00
1—Adams Model 311 Motor Patrol Grader 3,500.00
1—Caterpillar No. 11 Motor Patrol Grader 3,500.00
3—Koehring WHD 125 12½-yd. Tractors & Scrapers, Serials 1515 -16 -17.....6,500.00 ea.

FOR SALE

Allis-Chalmers Model HD-10W Long track diesel tractor with Gar Wood cable tip-dozer and double drum cable control unit. 1948 model like new.

P & H 1 cu. yd. Dragline model 455-A, 1947 Model, Serial #11044. This machine is equipped with Buda diesel engine and light plant. 50 foot boom and 1 yd. bucket. Like new.

Koehring Model 304 ¾ cu. yd. dragline and pull shovel combination, equipped with 40 foot boom and Buda diesel engine. This machine used one season and like new.

NODLAND-ALBERG CO.
Starbuck, Minn.

FOR SALE

2 International KS-7 Quarry Trucks (1946) with KS-8 Axles and Marion Quarry Bodies

One Osgood 1½ Yard Victor Shovel, Serial No. 2864.

Southern Quarries & Contracting Co.

150 East Broad Street
Columbus 15, Ohio

FOR SALE

Dunbrik Machine, all attachments.
Capacity: 14,00 Bricks per Day.
Racks and Pallets for same.
No. 16 Dunn Mixer and Skip Hoist.
Machine a little over a year old.
Franchise included.

Hydro-Korpak.
Semi-automatic, single block.
Purchased Feb. 1948. Will be factory rebuilt for the purchaser.
Rubber tired racks, pallets for 1500 blocks, 8" and 12".

JENISON BRICK & BLOCK CO. INC.
JENISON, MICHIGAN

AIR COMPRESSOR: 60 to 500 cu. ft. Portable.

BUCKET: ¾ yd. Yaun. Dragline, Basket type.

CONVEYORS: 1—24" Belt, 24 ft. long; 1—New 8" belt, 13 ft. long.

CRANES: 1—Loraine ¾ yd. 40 ft. boom with Backhoe; 1—Insley ⅜ yd. mounted on Corbett 7½ ton truck; 1—Link-Belt Speeder, model YC9.

CRUSHER: 1—Universal 10"x30" with power unit.

BITUMINOUS SUPPLY TANK: 1—New Rosco 800 gal. capacity.

ENGINES & POWER UNITS: New and Used various sizes.

FORMGRADER: 1—Cleveland, Model HAK-42A.

GENERATORS: 2—new Onan 12.5 KVA. 1—Westinghouse 125 KVA. 1—50 KVA Powered by 2 LeRoi heavy duty natural gas engines.

KETTLE: Tar—1—New 165 gal. Portable. Mfg. by White.

MIXERS: 1—10S Ransome, pneumatic tires; 1—7S CMC four steel wheels. 1—new ½ bag, pneumatic tires. 2—new Essick, 1 bag mortar. 1—Used, 1 bag Wonder mortar.

PUSHDOZERS: 2—30"x40" face for HD14 Tractor.

ROAD ROLLERS: 6—3 to 12 ton, three wheel and tandem. Diesel & Gas.

SCRAPERS: 1—LeTourneau, Model FP 14 yd. truck. 1—new Henry 3 yd. capacity. 3—new LaPlant-Choate, 1½ yd.

SHOVEL: 1—"Quick-Way", 4/10 yd. mounted on 5 ton Coleman Truck.

TRAILERS: 1—Fruehauf Lowboy 60 ton. 1—Fruehauf Semi 8 ton. 1—New Standard Semi 10 ton.

TRUCKS: 1—Studebaker 2½ ton, 6x6. 1—Chevrolet, 1½ ton, 4x4.

WINCHES: 1—Hyster, single drum for D8 Tractor. 1—Hyster, double drum for D4 tractor. 1—International TD18 for TD18 tractor, front mounted.

Falls City Sales Company
1212 Wilson St. Louisville 10, Kentucky
P. O. Box 776

4—Harding's Conical Ball Mills
3—30 x 8 1—30 x 6

Will Sacrifice
For Immediate Sale

KLATZKY BROTHERS
Calumet, Michigan

FOR SALE OR RENT

HD-19 Tractor with dozer. New.

Cat. D-8 2U-3835 with Angledozer.

Caterpillar D-7, 7M Series with Angledozer. $6,000.00.

Caterpillar D-7, 4T5634 with DDPCU and dozer.

AIR COMPRESSER RENTAL CO.
19615 Nottingham Rd. Cleveland 10, O.
Phone: KEnmore 8000

FOR SALE

1—150 ton ph, Cedarapids washing plant—complete with 220 volts, 3 Ph electric drive motors. Including 18"x80', 18"x197', 18"x 340' triple deck conveyor. Also 24"x90' feed conveyor with 10 yd. feed hopper.
4—60 ton Butler bins complete with scales.
1—100 ton, 3 compt. Butler bin.
1—24"x50' conveyor.
1—3'x8' double deck screen.
1—4'x14' triple deck screen.
1—40 HP 220, 3 PH 900 rpm electric motor with starting switch.
1—LeRoi, RA-4, 95 HP gas engine unit (clutch and outboard bearing).
1—8" Superior McCully crusher.

GURZICK SUPPLY CO.
Sault Ste. Marie, Michigan
Phone 1674

FOR SALE

1 Six inch sand pump. Mounted on 10x20 ft. barge powered by four cylinder Wisconsin engine. (Engine hasn't been used since it was overhauled.) Includes:

250 ft. of 6 inch pipe, 7 elbows and angles; 3 short joints; and 17 barrel floats. Barge needs some calking before being used.

Price complete.....$2,500.00

1—Caterpillar, Size 30
1—7 ft. Hydraulic Dozer.
All in good condition.

Priced to sell.....$1,200.00

General Shovel Dragline, Drag Bucket, All Equipped. Good Condition $2,500.00

TYLER CEMENT TILE & SILO WORKS
Tyler Minnesota

F. C. George Hydraulic 2 Unit, 3 Cell Block Machine with self feed hopper and all attachments for 8", 4" and 12" block.
12 cubic foot mixer
Cast aluminum regular pallets
Cast aluminum Redi-Furred pallets
Corner and square both end pallets
USED LESS THAN ONE YEAR

Will Sell at Reduced Price
—Terms Arranged—
Production up to 2800 per 8 hours

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Badger 6559

COMPLETE BLOCK PLANT

Stearns No. 9 with offbearer and 4", 8", 12" Mold Boxers. With all of above pallets and corners 8" Termite Cores.

Stearns 42 ft. mixer and extra blades.

50 ft. elevator with hopper to feed into.

Block cars—3 and 4 deck high. Used rail for these cars—also transfer car.

Some of this material has been used 2 to 6 months. Some repair parts have never been used.

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Phone—Shadyside 1600
MR. H. H. RENKER

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19—12" I beams 30' long
9—12" I beams 26' long
20— 9" I beams 30' long
50— 7" I beams 30' long
6—24" trusses 28' long
8—18" trusses 18' long

Also several tons 6", 8", and 10" channel up to 20' long and several tons 3½" x 3½", 4" x 4", and 6" x 6" angles up to 20' long.
Approx. 300' type B 16" cast iron soil pipe in 12' lengths—leaded at $6.75 per foot.
Approx. 200' of 8" cast iron soil pipe in 12' lengths at $3.50 per foot.
Approx. 200' of 10" and 12" steel pipe at 10 cents per pound.
Several thousand feet of black pipe in ¾", 1", 1¼", and 1½" sizes 5' to 20' long at 8 cents to 17 cents per foot.
Approx. 60 tons ⅛" and 3/16" mild steel plate in 3' x 5' and 3' x 8' sheets flame cut.
Many 8", 10" and 12" gate valves. All above material is used material in first class condition and is available for immediate delivery. We will fabricate for you if you desire.

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Post Office Box 497
Rochester - - - Minnesota
Telephones:
Daytimes 3148 Evenings 2-2332

FOR SALE

1 used Model LS85 ¾-yd heavy duty Link-Belt Speeder with shovel and dragline attachments. In good running condition.
1 D4 ¾-yd Speeder shovel with "Caterpillar" D8800 diesel motor. Priced to sell.
1 K-14 Insley shovel. Like new.
1 Model LS40 Link-Belt ⅝-yd with shovel and dragline attachments. In good condition.

RIHM MOTOR CO.
1641 University Ave. St. Paul, Minn.
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9 Jaeger 3-Cu. Yd. mixers, mounted on 1 White, 2 International, 6 Mack trucks.

All mixers and trucks 1941 models.

All are working now.

Price: From $1500 to $3000 each.

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1940 E. 6th St., Cleveland 14, O.

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USED EQUIPMENT IN STOCK

1—HD-14 tractor, 1942, with dozer, Double drum winch. Excellent condition.
1—New Slackline cableway excavator including Sauerman ½-cu. yd. bucket, carriage, American 2 drum hoist with Chrysler power unit, 62' steel mast, and all necessary cable and fittings.
1—Rex 2-yd Hi-boy truck mixer.
1—Jaeger low boy truck mixer.
1—½ yd. General Trenchoe excavator.
1—11 ft. Highway lime spreader.
1—9 ft. Highway lime spreader.
1—4-5-yd. St. Paul dump body with 7" hoist.

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Tractor—"Caterpillar" D2 with ⅝-yd. $3600.00

Engine—D7700 Caterpillar Engine with clutch $1600.00

Engine—D4400 Caterpillar Engine with clutch $1100.00

The above are rebuilt and in A-1 condition.

HARDINGS, INC.

Phone 4271 Lowell, Indiana

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1—Used D-8 Caterpillar Tractor—Serial No. 1H3247

1—Used D-8 Caterpillar Tractor (with Dozer) Serial No. 8R9011

2—Used LP 12-Yd. LeTourneau Carryall Scrapers

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Tele: Chicago Heights 90

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CRANE - CRAWLER with 35' boom — Serial 10146. 10-ton cap. at 12'. Good running condition. Waukesha gas power. Price $4000.00 f.o.b. our yard.

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4—Tournapulls—2 new & 2 used LeTourneau model D with Q Scrapers & AD Tiltdozers. Reasonable.

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1—Ditcher—P&H model 20/42, gas. Good condition.

1—Aggregate Dryer—Barber-Greene model 831 on semi-trailer. In new condition.

Hoists—Single & Double Drum gas powered.

Clamshells—½, ¾ and 1½ cu. yd.

3—Trucks—2 Ford Truckstell with 6 yd. Galion end dump Rock Bodies. 1 International with 2,000 gallon tank, pump & sprayers.

1—Turbo-Generator—GE 500 KW 3/60/2300 with Condenser.

1—Diesel-Generator—Caterpillar D-4600 with 30 KW 3/60/120-208 GE 1200 RPM Generator.

4—Air Compressors—1 used 315 cfm IR diesel powered on steel wheels, two 60 and one 88 cfm new Stationary Worthingtons with 3/60/440 motors.

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Electric Generating Sets

100 KW. D.C.
with
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Built 1943-1944
Excellent Condition
Available Immediate Shipment

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P. & H. TRUCK CRANE mounted on six wheel pneumatic tired Mack Truck, ½ yd. capacity, good condition

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2000 Pcs. BETH. SP4—35 to 42 ft.
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STEEL STORAGE TANKS
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8—10,000 & 15,000 Gal. Horizontal
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Austin-Western 99M Diesel Grader

1—Adnun (Mechanical) Paver

1—Adnun (Hydraulic) Paver

All in excellent condition

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One new Cyclone Blast Hole Churn Drill mounted on full crawler, gasoline driven, with drill designed for 2000 lbs. of tools, recommended drilling range from 5⅝" to 6⅝" diameter holes. This drill is offered at a special price as an entirely new model drill now in production.

SANDERSON CYCLONE DRILL CO.,
Orrville, Ohio

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15 Buckeye Model 70 Shovels or Cranes, practically new.....**$6,000 Each**

15 Quick-Ways with Crane Booms

1—Northwest No. 8

1—Lippmann pulverizer, 14-34 with bucket elevator mounted on steel wheels, like new—$850.

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1—2 c.y. Osgood Shovel, Model 90, Buda 1611 Diesel Engine, 24' Boom, 20' Sticks, with 80' Dragline Attachment and 2 c. y. Page Bucket.

1—1945 WA26 White Truck, with 8 c. y. Rock Dump Body, Serial No. 322427.

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Snyder County
Middleburg, Pennsylvania

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3—Remanufactured EUCLID 15-ton capacity Diesel powered Rear Dump earth haulers.

1—Remanufactured AUSTIN-WESTERN 10-ton three-wheel Autocrat roller with Buda engine.

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GEN. SUPT. or SUPT. Available NOW. 30 years' Experience. Supervising and Building Highways —Streets, All Types—Large Sewers—Air Ports—Concrete Bridges —Earth Fill—Dams—Heavy Excavating — Organizer — Know Cost. Available, Best References. Box 1007, ROADS & STREETS, 22 W. Maple St., Chicago 10, Ill.

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1942 Sterling — Model 144 — Chain drive, 5-Yd. Body. Perfect condition.

Mack—Model FN—Chain drive. Very low mileage. Was used by town. 5-Yd. Body with Hydraulic V-shape snow plow. Priced to sell. Several other big, cheap dump trucks. Also Bodies and Hoists.

3—1941 Model F.G. Chain Drive Mack Dump Trucks.

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Allis-Chalmers—Model HD 14—Used about 2,000 Hours. A-1 Condition. Priced to be sold.

¾-YD. SHOVEL

Byers with Backhoe attachment. Model 83. Extra fine condition. Shows no wear.

10-WHEEL TRUCKS

4 GMC 804 Cab over engine. Will take 20 foot body or suitable for mounting cranes. Were used by oil companies. Exceptionally good condition. $1,000 each.

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2—1943 available; 10 Wheeler, H.B. 600 Cummins Diesel, dual drive, 22 ft. platform with spool type winch, less than 1500 mi.

1946 Sterling Tractor—with HB 600 Cummins Diesel. Suitable for heavy hauling or low bed trailer work.

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1 TWIN SAND DEWATERING SCREW.
SEND COMPLETE DATA. TRMCO.
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Lima 1201 Dragline—3 yd.
Bu.Er 37B Comb. 1½ yd.
Marion Type 37 Elec. 1¾ yd.
Lima 503 1¼ Shovel and Drag.

Euclids end dump and bottom dump—Tournawagons—Super C tournapulls.

Steam cranes std. ga. Gas or diesel Loco—24, 36, 42 in. ga. Elec. Loco—St. Ga. 20 Ton. Dump Cars 55 Cu. Ft., 130 Cu. Ft., 16 cu ft. Ore Cars Std. Ga. 50 tons.

Rotary Kilns—Rod Mills—16"-30" Gyratory Crushers—30x18, 40x22 Roll Crushers—40G Slugger Hammermill—9x36, 10x24, 10x36, 14x24, 18x36, 20x36, 24x36, 30x42, 40x42, 42x60 Jaw Crushers some portable some with feeders—Cone crushers 3 and 4 Ft.—Screens sgl. and double and triple dk. Feeders 3x10, 30x5—Door Classifiers—Cent. pumps—Deep well pumps—Tuggers—Mine hoists—75, 100, 150, 225 H.P.—Motors—Transformers—Conveyors—Portable Gravel Plants—Road rollers—Wagon Drills—Bu. Er. 29T and 42T Blast Hole Drills—Many other items.

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Pile Driving Equipment

Vulcan and McKiernan-Terry
Steam Pile Hammers and Extractors
Pile Driving Accessories
Drop Pile Hammers and Caps
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FOR SALE

Barber-Greene 44C digging machine with 5'6" x 12"-18" digger boom; like new with less than 100 hours operating time. $6995.00.

Barber-Greene 44C chassis with no boom. Very good condition. $2995.00.

Central Florida Contractors
Box 56 **Tel. 510**
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FOR SALE

1—⅛-yd. P&H shovel, Model 150, Serial No. 6367, recently overhauled, new motor.
1—½-yd Link-Belt Speeder shovel Model LS-60, completely overhauled.
1—Lippman conveyor, size 24"x40', Serial No. 460906 with 5 h.p. LeRoi motor, like new.

WM. EBERTZ CO., INC.
2028 Upper Afton Rd., TOwer 4918, St. Paul, Minn.

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Bullgrader Repair parts. Set includes cutting edge, 6 corner shoes, all hoses, wedges, piston rod packing, plow bolts, and misc. fittings for TD 14 Bucyrus-Erie angledozer. $75.00 per set.

Winch lines ¾" x 300' plow steel with hook. $50.00 each.

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SNOW PLOW

One 1946 F.W.D. with V plow and wing, 9,000 miles. Truck and plow like new. Truck has hoist and steel flat bed.

BELL MOTOR CO., INC.
Hastings, Minn.
Phone 131

FOR SALE

SHOVELS

1 ½-yd. 15 B Bucyrus-Erie shovel, June '48, $10,500
1 ¾-yd. American with backhoe and dragline, new February '47, $13,000
1 ¾-yd. P&H comb. shovel and dragline, just overhauled, new '41, $8,500
1 1¼-yd. Lima comb. shovel and dragline, completely overhauled and painted, $21,000
1 ¾-yd. 22-B Bucyrus-Erie comb. shovel and dragline, completely overhauled and painted, $12,000
1 ¾-yd. LS-85 Speeder comb. shovel and dragline, new June '46, $16,000
1 ¾-yd. LS-80 Speeder comb. shovel and dragline, A-1 cond. New 1942, $11,000
1 ½-yd. K-12 Insley No. 259, comb. shovel and dragline, $6,800
1 1¼-yd. Northwest crane. In excellent cond., $6,000
1 ½-yd. American GS-297 comb. shovel and dragline, $6,000
1 ½-yd. American GS-307 dragline, $5,500

TRACTORS

1 D7 Caterpillar with 2½ yd. Traxcavator, front end loader, new May '46, $12,000
1 Model L AC tractor, completely overhauled, low speed, low gear, hydraulic control, $2,250
1 Model L AC in A-1 cond., low speed, low gear, Heil 8-yd. hydraulic scraper, $3,500
1 D8 Caterpillar 8-4-3278 with DD PCU, cab, lights, just overhauled, $12,000
1 D8 Caterpillar 8-4-9325 with DD PCU and Caterpillar dozer, just overhauled, $15,000
1 No. 50 Caterpillar with LaPlant-Choate hydraulic dozer, in exceptional condition, $3,000
1 RD-8 Caterpillar 1-H-1335 with DD PCU LeTourneau straight dozer, $12,500
1 RD-8 1-H-1619 with DD PCU LeTourneau straight dozer and Model J scraper, $16,000
1 D-8 Caterpillar 1-H-2435 with DD PCU LeTourneau angle dozer and Model F scraper, $16,500
1 D-4 Caterpillar 4-G-6335 with LaPlant-Choate hydraulic dozer, as is, $2,300
1 FDE Cletrac F-10-108 with rear winch and push plate, $6,500
1 R-4 Caterpillar with LaPlant-Choate dozer, $2,600
1 FD Cletrac diesel motor and dozer, $2,000
1 RD6—Completely overhauled New Tracks, Rails and Rollers, $4,250

SCRAPERS

1 Gar Wood 525 No. 5224 25-yd., like new, $4,500
1 LaPlant-Choate S-72W2 Model C108 8-11 yd. new Sept. '46, $3,800
1 LeTourneau S-2173 J 12 Model J, with 6 14:00 x 24 tires, $3,500
1 LeTourneau S-6990 Model F with 4 18:00 x 24 tires, $3,500

PATROLS

1 AC Model AD-3, new '47 completely overhauled, $8,000
1 Adams No. 411 with cab, lights and scarifier, A-1 cond. $5,000
1 Wehr, $1,000
1 Adams, $1,000

CONVEYORS

1 24" 32' Coyle & Roth mounted on AC tractor, 2½ yd. hopper, ¾" Grizzley, new belt, $1,200
1 24" 45' with V-4 Wisconsin motor with vibrating screen, 7:00 x 20 tires, 2½-yd. hopper, $1,900

COMPRESSORS

1 Sullivan S-13182, 260 cfm, rubber tired, $600
1 Chicago-Pneumatic S-36154, 105 cfm, steel wheels, like new, $2,000
1 LeRoi S-238690, 315 cfm, rubber tired, new June '48, 1850 hrs. $5,500

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1 Gardner-Denver with G-209 hammer, new June '48, $1,900
3 Gardner-Denvers, just overhauled, each $1,750

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7 tractors with scrapers, completely overhauled, new '46 and '47, each $18,500

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New Chevrolet, 5 yd. box, Truckstell conversion. 12 speeds forward, 3 speeds reverse. Brand new.

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Bell and Spigot Class 150 and 250

2,100 ft. 4 in.	14,250 ft. 10 in.	3,000 ft. 20 in.
21,500 ft. 6 in.	32,450 ft. 12 in.	11,000 ft. 24 in.
16,280 ft. 8 in.		

12 ft. and 18 ft. length

Immediate Delivery Any Quantity

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GOOD EQUIPMENT FROM OUR OWN INVENTORY FOR QUICK SALE

#1013 Late 1948. Reo Model 31 Tractor. Serial #31T65336. 200 H.P. Air Brakes, Tulsa Winch, Sanders, Derrick, Freuhauf Low Bed Trailer. Serial #FW40835. Tandem Axle. 25 ton capacity. Like new condition. 23,000 miles.....$12,500.00

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#1033 Late 1948. HD-5 Allis Chalmers. Serial #2388. With Baker Hydraulic dozer blade and Carco winch. Few months old, like new.....$5,800.00

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Heavy duty Brush Rake also available for above unit.....$2,000.00 extra

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#1044 Late 1947. HD-10W Allis Chalmers. Serial #5966W. Baker Hydraulic Angle dozer and rear mounted Garwood C.P.U. long track large idlers. Very good condition $9,500.00

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#1028 D7 Caterpillar. Serial #7M9022. Large front idlers. Equipped with new type Cat. front end cable blade and Hyster winch. Good condition..... $12,000.00

#306 D7 Caterpillar. Serial # 415755. Equipped with LaPlant Choate and dozer. Good condition..... $9,500.00

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Tractor Division

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We have an opening for a top flight bituminous concrete superintendent with general experience in all types of asphalt and cement concrete paving. Position will be permanent, at good salary, with future in growing company. Operations are generally in Kentucky, but not limited thereto. Home office is in small town in Bluegrass Section. Prefer man with family, willing to settle in town where home office is located. However, this is not mandatory. Send full particulars regarding experience, and pertinent personal information. Also furnish names and addresses of present and past employers. Any applicant considered favorably will be contacted and arrangements made for interview.

Write Box 1005

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1—Lima Paymaster, combination shovel & backhoe.
1—Lorain Model 41, combination shovel backhoe & crane.
1—1½-yd. Osgood diesel shovel and crane.
1—1¾-yd. Lima, Model 750 diesel shovel and crane.
1—1¾-yd. Osgood diesel shovel.
1—Moto truck crane.
1—Scoop Mobile.
1—I-6 International diesel bulldozer blade with broom on rubber tires.
1—D-8 tractor with bulldozer.
1—D-7 tractor with bulldozer.
1—500' Worthington compressor diesel.
2—Worthington wagon drills.
1—Dust collector.
4—Rear End Euclid trucks.

TUCKAHOE CONSTRUCTION CO., INC.
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FOR SALE
AT A RIGHT PRICE:

1—Sterling Diesel Tandem Tractor with a new H.B. 600 Cummings Motor. Tractor completely rebuilt two months ago by Sterling Motors.
1—90 Ton Rogers "I" Beam Trailer.
1—D3 1947 Ward La France Standard Tractor.
1—25 Ton 1947 Lilly Low-Boy Trailer with eight 825-15 tires.
1—D3 1947 Ward La France Tractor with 5 Speed Main Transmission, 3 Speed Auxiliary, Low Speed Timken rear end. 1200x20 tires.
1—1947 Fruehauf 50 Ton Low-Boy Drop Deck Trailer with 16-750x18 tires.
1—Rogers Low-Boy with 80 Ton Drop Deck. 750x18 tires.
1—Dorsey High-Trailer, Flat Deck, 35 feet long using 1100x24 tires.
1—25 ft. Fruehauf High Trailer, flat deck with 1100x24 tires.

WANTED:

1—Model 32 Hanson Shovel Front.
Write:

T. J. Kilmain Sales Co.
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MECHANICAL ENGINEERS

Graduate Engineers wanted with construction experience. Have openings for several men as Maintenance Supervisors with large construction firm, working in Central and Western States. Salary according to qualifications. Advancement limited only by your abilities.
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Late Model "Caterpillar" D4 tractor and traxcavator, Ser. #5T2604W, complete with ¾ yd. digging bucket, 1 yd. material handling bucket, bulldozer blade and spare parts. Has operated 2800 hrs.

In first class condition, priced right.

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Complete portable crushing plant consisting of:

1 Primary Unit:
20 x 36 Iowa jaw crusher with 3 x 12 apron feeder. This plant is on rubber and is 2 years old.

1 Secondary pulverizing plant:
3 x 10 Iowa screen
22" pulverizer
powered by M. E. 6 Murphy Diesel. This plant is on rubber and is 2 years old.

1 Northwest ½ yd. shovel. New in '39. In 1st class condition.

1—Bucyrus-Erie well drill.

1—Air Compressor, 105 cu. ft. Ingersoll Rand New in '41. Complete with jack hammer, steel and hose.

1—Portable Hobart welding outfit.

1—Scale, Bondant 20 T scales. 2 years old.

1—Allis-Chalmers L cat with LaPlant-Choate hydraulic dozer. 1939 model.

1—Bucyrus-Erie hydraulic dozer to fit International TD14 cat. 2 years old.

1—Baker hydraulic dozer to fit Allis-Chalmers HD10. Six months old.

Portable gas tanks, tool shop, office and miscellaneous equipment.

2—1941 quarry trucks.
1—1948 Ford truck.
1—1947 Ford truck.

Also lime and gravel boxes.

This plant is now working and producing 70 tons of material per hour.

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One (1) 34E Dual Drum Koehring Paver, completely overhauled—Serial No. 18643
One (1) Butler Car Scoop for unloading bulk cement, factory rebuilt—Serial No. CH106
Two (2) C. H. & E. No. 11 Triplex 3" Road Water Pumps.
200 Lin. Ft. Steel Face Forms for 9" Curb
One (1) 20' to 25' Type H Jaeger Finishing Machine
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Two (2) Butler V 36 Aggregate Bins, including Weighers
One (1) 20' to 25' Lakewood Pull Subgrader
One (1) AN D8 Single Power Control Unit
2500 Lin. Ft. Special 15" x 10" Heavy Duty Heltzel Steel Road Forms
All of the above equipment located in Milwaukee, price on application.

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52 Scrapers, tractor drawn
53 Scrapers, self-powered

XIII BUCKETS:
54 Clamshell
55 Concrete
56 Dragline
57 Orange Peel

XIV SHOVELS AND DRAGLINE:
58 Crawler (under 1 yd.)
59 Crawler (1 yd. up)
60 Truck Mounted

XV ROCK DRILLS AND AIR TOOLS:
61 Air Compressors
62 Backfill Tampers
63 Clay Diggers
64 Concrete Vibrators
65 Drills, cable tool
66 Drills, tripod and wagon
67 Drills, rock, hand-held
68 Paint Sprayers
69 Paving Breakers
70 Riveters and Chippers

XVI MISCELLANEOUS:
71 Buildings, portable
72 Earth Drills, power
73 Light Plants
74 Lubrication, Service
75 Mowers, Highway
76 Power Saws
77 Soil Stabilizing Equipment
78 Spreaders, sand
79 Street Flushers
80 Street Sweepers
81 Welders
82 Cutting Torches
83 Hydraulic Jacks
84 Hydraulic Control Equipment
85 Hand Tools
86 Hoists, derrick type
87 Highway Guard
88 Snowplows, rotary
89 Snowplows, v or wing

Be sure to fill in name and address below:

Title

Your Name.....or profession.....

Name of your company or governmental department.....

Type of work for which equipment will be used.....

Street Address.....

City..... State..... County.....

BIGGER YARDAGE PRODUCTION WITH THE NEW 25 CUBIC YARD BOTTOM DUMP EUCLID

OUTSTANDING FEATURES

- 25 yards struck capacity, 78,000 lb. payload
- Diesel engine to 275 h.p. rating
- Loaded top speeds to 24.1 m.p.h.
- Hydraulic booster steer is standard equipment
- Comfortable driver's seat with shock absorber
- Big 27.00 x 33 tires on drive and trailer wheels

For earth moving operations requiring big yardage production, this large capacity Bottom-Dump Euclid fills the bill. Its low height and wide hopper facilitate loading by big shovels, draglines, overhead hoppers, and the Euclid Loader. Short wheel base of tractor and the universal hitch design permit short turns and assure easy handling.

Big tires on drive and trailer wheels — size 27.00 x 33 — provide good traction and flotation for steep grades and soft fills. Hydraulic booster steering reduces driver effort and gives positive control in tough going. A form fitting driver's seat with hydraulic shock absorber affords good riding comfort on rough roads . . . is adjustable for driver's weight and position.

Engineered for endurance, this husky Euclid hauls big loads at high speeds...pays off in better profits and all-around economy.

SEE OR WRITE YOUR EUCLID DISTRIBUTOR FOR COMPLETE INFORMATION ON THIS NEW MODEL LDT BOTTOM-DUMP EUCLID

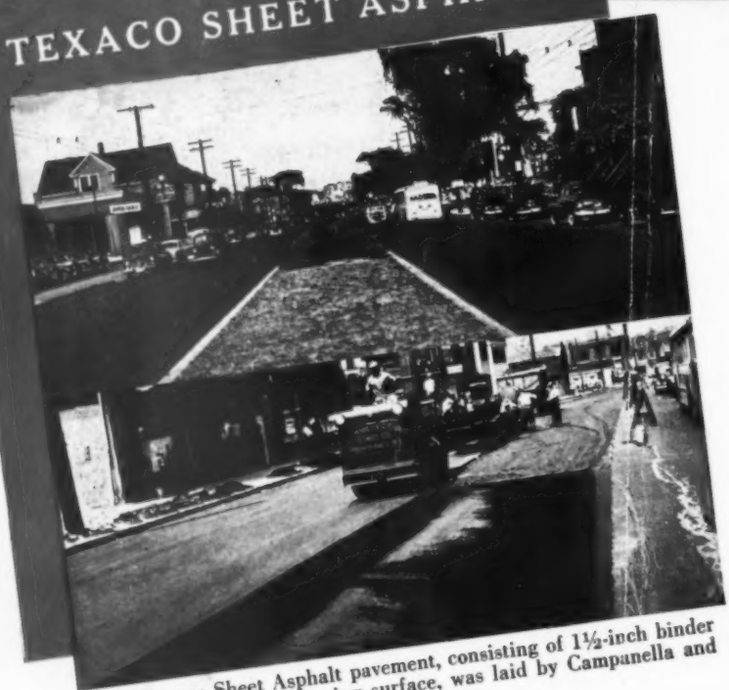
The EUCLID ROAD MACHINERY Co., Cleveland 17, Ohio

EUCLIDS *Move the Earth*

What type of pavement for 30,000-VEHICLE-A-DAY TRAFFIC?

Texaco Sheet Asphalt on North Main Street (U.S. Route 1), P dence, R.I. The resilient, rugged, joint-free qualities of this of pavement pay off in long service and low upkeep under hea traffic.

Rhode Island's answer was TEXACO SHEET ASPHALT



This Texaco Sheet Asphalt pavement, consisting of 1½-inch binder course and 1½-inch wearing surface, was laid by Campanella and Cardi Construction Company, Providence.

In addition to heavy local traffic, North M Street, Providence, R. I., serves a large volum through traffic, since it is a link in U. S. Rout principal Maine-to-Florida highway. The 24-h traffic count is 30,000 vehicles, with a peak loa 3,500 an hour.

Construction of a Texaco Sheet Asphalt pave on this heavily travelled thoroughfare by the Rh Island Department of Public Works is an old st During the past 40 years, this resilient, heavy-d type of plant-mixed asphalt paving has been laid scores of the country's busiest traffic arteries. sheet asphalt pavement on North Main Street con of the usual two courses, binder course and wear surface, each 1½ inches thick.

For a detailed description of Texaco Sheet Asph as well as of other heavy-duty and low-cost type plant-mixed asphalt construction for streets, highw and airports, ask our nearest office to send yo copy of the booklet, "Texaco Asphalt Paving—Pl mixed Types."

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